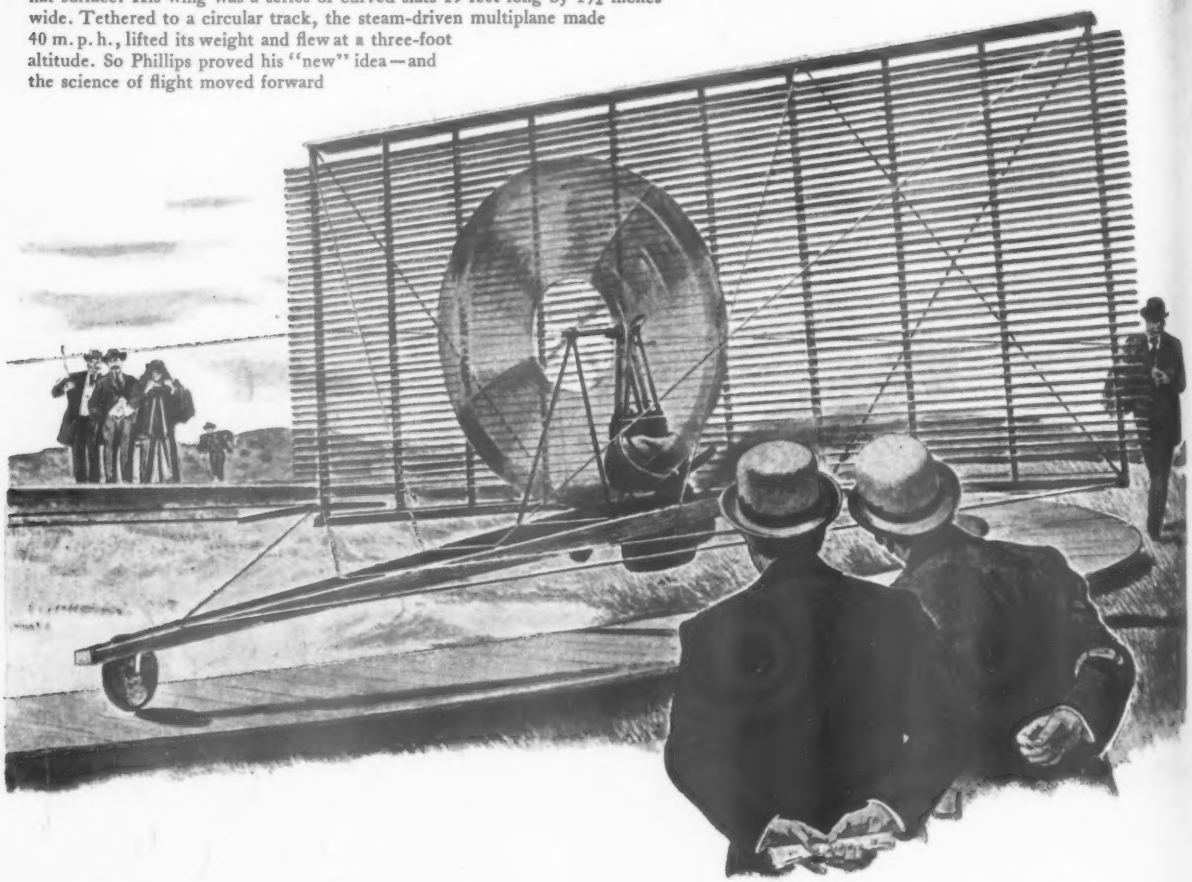
FLYING

Horatio F. Phillips, of England, built this 330 lb. model to test his theory—"radical" in 1893—that a curved surface would provide more Lift than a flat surface. His wing was a series of curved slats 19 feet long by 1½ inches wide. Tethered to a circular track, the steam-driven multiplane made 40 m. p. h., lifted its weight and flew at a three-foot altitude. So Phillips proved his "new" idea—and the science of flight moved forward



The Flying "Venetian Blind"

...it pioneered curved wing-surfaces

Note how man's wings have grown and strengthened. From fragile "Venetian Blind" to guy-wired biplane to *multicellular, internally-braced wing of metal,* pioneered by Northrop in 1929.

Trace on through developments like *split flaps* (Northrop, 1932) which increased the lift of wings. On to *retractable ailerons* (Northrop, 1941) which gave big airplanes faster take-off, greater maneuverability and slower landing speed. And now the Northrop *Flying Wing,* which eliminates fuselage, houses everything in the wing.

Yes, revolutions in design continue. They are a "must" for peace-loving nations as insurance against aggression. A "must," too, for cheaper, faster air commerce and transport.

And creating "firsts" in design is but part of the job. To keep advancing, aviation needs men of experience to prove and develop such ideas. Plus men of skill to produce them in quantity. Plus men trained to fly them on the missions of peace.

Today the aircraft industry must keep strong, keep going ahead.

ARMY (E) NAVY

NORTHROP

Creators and Builders of the ***Black Widow*** *P-61 Night Fighter and the* ***Flying Wing***

He's shaking hands with 90° below

RUBBER PARTS for planes have to function properly at the lowest temperatures apt to be encountered in flight. So B. F. Goodrich moved those temperatures into the testing laboratories.

They built a large new "cold room" —a refrigerator 30 feet long and 15 feet wide. In three of five chambers, a temperature of 64° below zero can be maintained. And then there's the extra-cold chamber where a smaller box manufactures a 90° below temperature.

The man in the picture above is testing airplane hose in the extra-cold chamber. The hose has to be able to flex in stratosphere cold. B. F. Goodrich technicians know that if it can stand *this* test and stay flexible, there is little to fear from nature.

The war proved how necessary this kind of testing is. Ground temperatures of 65° below were encountered in Alaska and Siberia. And at high altitudes, even lower temperatures were recorded.

That's why so many B. F. Goodrich products for planes now get the sub-zero treatment. Hydraulic hose, carburetor diaphragms, accumulators, de-icing equipment, air valves, fuel cells and others have to prove they function properly at low temperatures before they get on an airplane.

This new B. F. Goodrich cold room is an important aid to new product development and research. It is one more example of the way B. F. Goodrich keeps ready to meet the demands of *tomorrow's* aviation customers. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

Skyway or Highway

B.F.Goodrich

FIRST IN RUBBER

FLYING

VOLUME 38 • NUMBER 3

MARCH • 1946

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THE COVER

Three Aeronca Champions fly formation over the green Ohio countryside in this kodachrome by Hans Groenhoff who has captured something of the feeling of freedom which inspires flightplane pilots. The Champion has a 65-h.p. engine, cruises at 90 m.p.h., has a range of 420 miles, empty weight of 710 pounds, useful load of 525 pounds, a span of 35 feet. Its length is 21 ft. 6 in.

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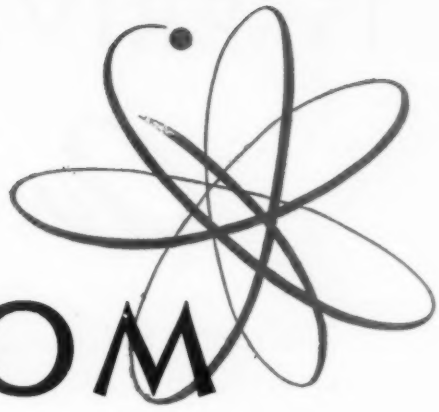


THE ATOM AND AVIATION

Adviser to three presidents and world-famed as a sociologist, Dr. Ogburn is chairman of the department of sociology at the University of Chicago. He has written numerous books, including the forthcoming "Social Effects of Aviation." Dr. Ogburn has studied the atomic research activities at the university intensely and is especially concerned with what release of atomic energy means in our daily lives.

By WILLIAM F. OGBURN

Do you believe that atomic energy signifies only bombs? This sober analysis hints of things to come.

IN THE squash court at the University of Chicago, in which I used to play, the atomic age began on December 2, 1942. Then and there, scientists experimenting with a uranium pile observed the first chain reaction of nuclear fissioning of the uranium atom, behaving like a package of fire crackers after the first one is lit. Thus the atomic bomb was made possible.

Aviation, which has its face turned toward the future more than almost any other major industry, wants to know how its role will be affected in the coming atomic age.

No appreciable effect is expected in the immediate future. But later, perhaps, miracles for aviation will occur. These may take two forms: first, the use of atomic energy to drive planes directly, and second, the long range social effects which will be created if the atomic bomb, or the threat of atomic bombing, forces decentralization of our major cities.

Will a pinch of uranium replace gasoline and drive an airplane several hundred thousand miles? The fuel in the *Superfortresses* that flew from Guam non-stop to Washington weighed almost as much as the plane itself. With all that weight saved for a payload of passengers or cargo there would be no difficulty in interesting airline executives in an atomic power plant. But there is no answer to give them yet.

The first peacetime use of atomic energies will be to heat water on a large scale. Atomic heat from the uranium piles at Hanford, Wash., actually raised the temperature of the Columbia River. So the first peacetime use of this new fuel likely will be to run an electric generating station for a city. Atomic energy will merely replace coal. But first, it must be cheaper than coal. This probably will be the case eventually, although we do not know when. That nuclear energy may some time be very cheap is suggested by the fact that there is enough (*Continued on page* 82)

IS PRIVATE FLYING *Oversold?*

Yes, says the author, unless flying becomes safer, airports are made more accessible, and everyone works to give personal planes greater utility.

By JOHN H. GEISSE
Assistant CAA Administrator for Personal Flying Development

POST-WAR market surveys indicate the public came out of the war air-minded and if it does not lose its enthusiasm it can be expected to spend $1,000,000,000 on personal flying in 1955.

But—and this is a big but—this enthusiasm can be dissipated if we do not have a marked change in the apparent attitude of many in the aircraft industry.

While there is real danger that this present enthusiasm may destroy itself, it is leading many in the industry to believe that all they have to do now is to take orders. Too many are forgetting that of the pre-war aviation enthusiasts we managed to keep only about 15 per cent sold. Absorbed as they are in preparing to take orders thrust upon them, manufacturers are forgetting for example that from 1931 to 1936 they had about 15,000 new purchasers of aircraft, but that in the same period they also lost 14,800 customers, a net gain of only 200.

We believe we know the factors which accounted for the poor showing before the war, but what are we doing to correct them?

A poor accident record was certainly a major factor, not only because of the injuries to personnel but because of repair cost. In the five-year period preceding the Civilian Pilot Training Program, 1934 to 1938 inclusive, there was an average of one fatality a year for each 33 airplanes in use. In the same period an average of one airplane out of each 26 was completely destroyed in an accident and an additional one out of each seven was sufficiently damaged to require complete overhaul or major assembly repairs.

Careless flying near airports makes noise and crashes —and leads home-owners to oppose close-in airfields.

The AAF Office of Flying Safety, after studying its accident records, concluded:

"The Army Air Forces accident record demonstrates that the lightplane is highly susceptible to accident damage and that the safety problem is particularly acute in those models most comparable to the private airplane." [Also see "Stop Blaming the Pilot," FLYING, February, 1946].

Nevertheless, we are planning to produce 30,000 to 50,000 airplanes in 1945 which do not differ from pre-war models sufficiently to change this record. If there was evidence that producers were bending every effort to develop changes in design which could be introduced to the assembly line at the earliest practicable moment to improve the record, there would be very little to worry about. However, such evidence seems to be lacking. Not all of these designs are pre-war; some are new. Some manufacturers still see no need for change; their contention being that accidents are due entirely to incompetence or carelessness. In this contention they are undoubtedly correct, but since it is unlikely that human beings have changed much during the war, we will have to concentrate on improving the airplanes if we are to achieve a safety record that will help subsequent sales.

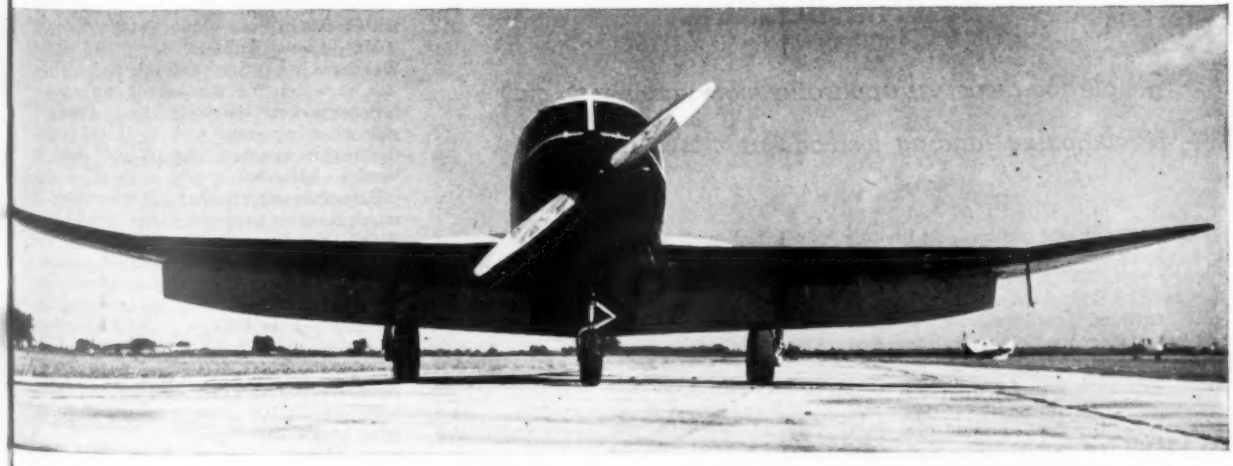
Ranking next to the factor of accidents is the factor of inaccessible airports. Here again we do not seem to be doing all we can to reduce this barrier to growth. There are many things we could do, which we are not doing.

In the selection of airports there is a decided tendency to choose an inconvenient site because it offers opportunities for expansion at some later date or because the site is cheaper. We even consider constructing one airport to serve two communities 15 to 20 miles apart. No one would consider acquiring a small building between towns to establish a mens' clothing store simply because he could get the building cheaper or because there was room to expand it into a department store. It would surely fail through lack of customers. Yet private flying is in no different category. An inconvenient airport will attract only a fraction of those who would use one close at hand. A survey made prior to the war revealed that inaccessibility of airports was the second greatest reason for discontinuing flying.

I have never been able to understand why it is assumed that if an airport suitable for private flying is not located where it can be enlarged it will necessarily have to be abandoned later at a large loss. Most fields in the past have been wholly supported by non-scheduled operations, some in communities of less than 5,000 population. In many cases where there has been both scheduled and non-scheduled operation from the same field the non-scheduled supplied most of the revenue. In some cases airlines have

(*Continued on page* 100)

Roadability? Not impossible. The author drives CAA's roadable autogiro through Washington streets. He believes that roadability would vastly increase personal plane utility and argues that the roadable plane, though admittedly slower, ultimately might prove more satisfactory by permitting pilots to proceed on the ground after being weathered in.



Tricycle undercarriage, as installed on Culver Model, V, is a partial answer to dangers of cross-wind landings. The author regrets that comparatively few manufacturers are using tricycle gear on their 1946 models.

FOG CUTTER

1 You can't see it here, but San Francisco's Golden Gate Bridge lies two miles ahead through fog. It is October 14, 1945, and Clelland Ross Pleasants, inventor, is making one of the first public demonstrations of "Nofog." For results, see picture 2 on the next page.

By PHIL BUSKIRK

Simple fog-dispersal apparatus, now under test, may revolutionize landing methods at closed-in airports.

AIRPORT fog, one of the worst hazards in aviation, may soon be a thing of the past. Using a formula which he has been working on for the past 10 years, Clelland Ross Pleasants, a California chemist, recently watched the first practical application of his *Nofog* process.

The Long Beach, Calif., Airport was fogged in with visibility zero-zero when Pleasants drove up with his bags of chemicals and equipment. Before long, his oil drums held raging fires. Gases heated to 1,600° arose in the air. Exactly what those chemicals are is a secret, but before long the fog began to disappear as if a giant knife were carving out a section 500 feet high and three quarters of a mile broad.

A Western Air Lines plane, which otherwise would have had to make its landing elsewhere, came in, dropped passengers and, with new fares aboard, took off.

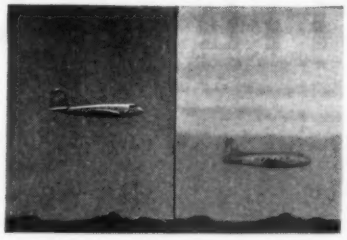
Norman Edson, pilot of the airliner, had only praise for the manner in which Pleasants' fog cutter had worked. He declared that the invention may soon rank with radar in the conquest of fog.

Maj. Louis Kolb, of the AAF 101st Weather Group, attended this demonstration to watch the take-off of three military transports following the airliner. "I saw what happened with my own eyes," the major testified, "but I still find it hard to believe."

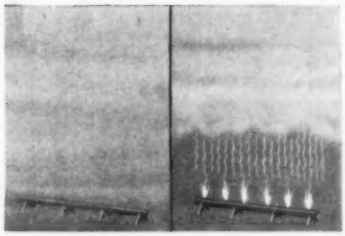
Pleasants asserts that his invention is much cheaper to operate than the British FIDO (Fog Investigation Dispersal Operations) used during the war. A demonstration such as he had just given cost only $15 and the effects, he believes, are far superior to FIDO's. (FIDO consists of a huge box of metal pipelines which provide lanes of fire along runways to burn off ground fogs. The sheet of flame consumes 75,000 gallons of gasoline an hour at the rate of 6,000 gallons per aircraft landed).

By reducing the air's relative humidity, *Nofog* enables the atmosphere to absorb

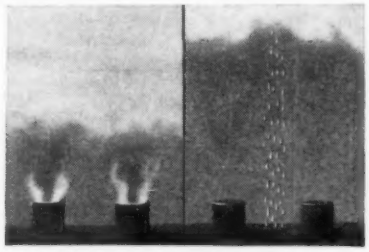
PRINCIPLES OF FOG CONTROL



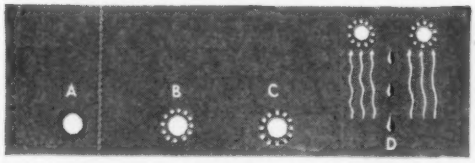
Warm air can carry more moisture than cool air. When saturated warm air is cooled, fog may form as is illustrated in the drawing above, at right.



One means of dispersing fog is the English FIDO system. Oil carried in special pipe lines is burned around field, heating air enough to clear fog.



"Nofog" sends up particles which attract moisture. The chemical process takes up latent heat of vapor, thus raises air temperature to clear fog.



In "Nofog" process, A represents carbon nucleus and hygroscopic agent; in B, it encounters water vapor; C shows how it prevents water from revaporizing; D shows how heat carries particles up.

some of the fog, carries away the balance of the remainder, and drops the excess like rain. If the three-month airfield test which has just begun comes up to previous results, the English fog dispersal system may be obsolete.

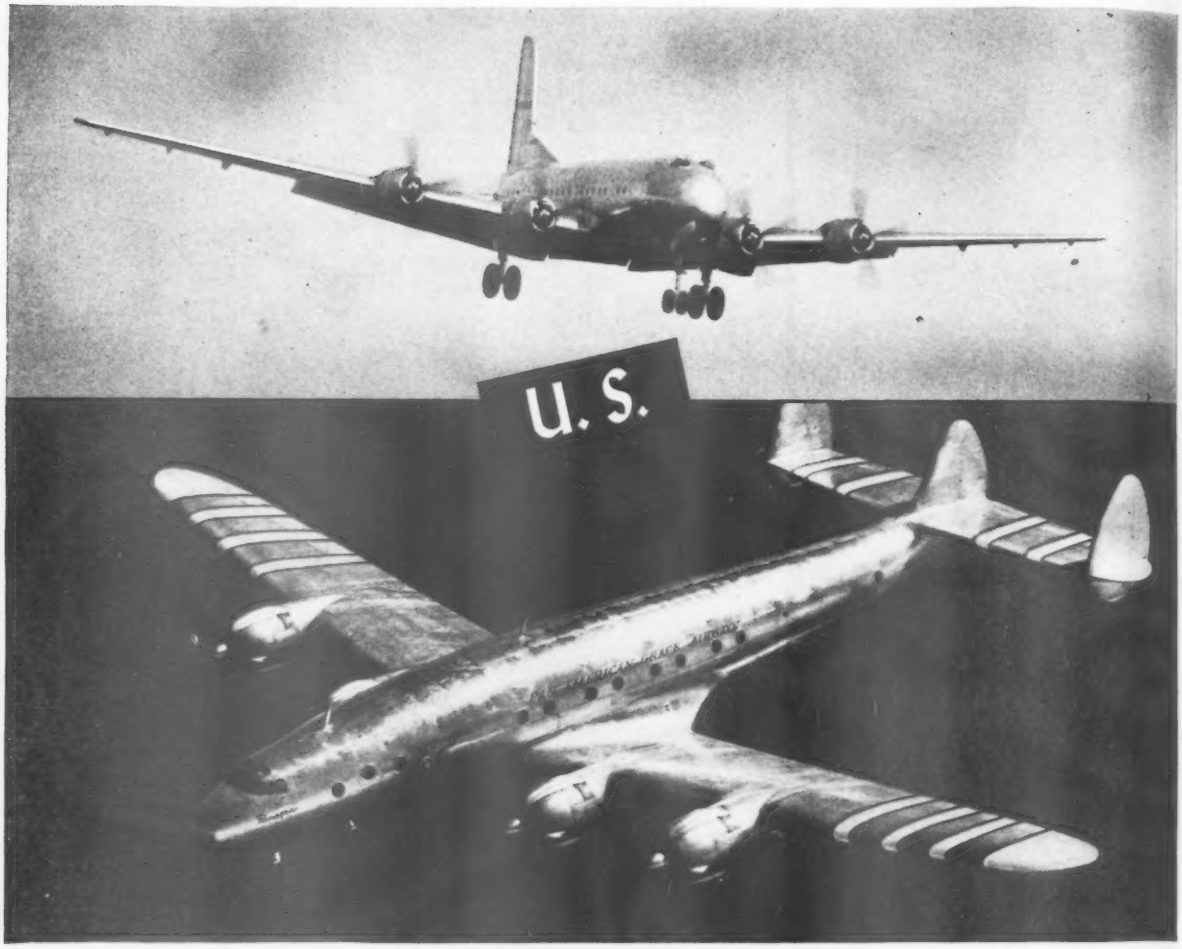
Before describing how *Nofog* works, it may be well to state briefly just what fog is. Fog consists of visible water droplets, or ice particles, suspended in the atmosphere. It differs from other clouds in that it exists on the ground or on the surface of bodies of water, while other clouds may be thousands of feet aloft. It also differs from rain or mist in that its water or ice particles are suspended and do not fall earthward. Fog varies in depth from a few feet to many hundreds of feet. Its density is variable, resulting in visibilities from near zero to as much as 1,100 yards. Above this limit, it is called haze (see FLYING, February, 1946, page 44).

Any of several agents which readily

(*Continued on page* 103)

2 Fog in Picture 1 is clearing. Bridge is faintly visible in distance and nearer objects are quite clear. Successful plane landings have been made with Nofog help.

THE AVIATION



During the war, the U. S. continued to develop and produce such fine exportable transports as the Globemaster (top) and Constellation.

By
FRED HAMLIN
Washington Editor of FLYING

Handicapped by concentration on military types during war, Britain challenges U.S. with an export sales campaign.

AIRCRAFT manufacturers of the United States and Britain, so closely allied during the war, are now keen rivals in a race to capture the world's export markets. Already, the challenge has sounded.

The first shot was fired by the Society of British Aircraft Constructors' export section which publicly announced a campaign "to regain *their* place as the world's leading exporters of aircraft, aircraft accessories and aircraft materials." The challenge is there, but the reference to Britain "regaining" leadership in the export field is more fiction than fact. According to statistics compiled by the Bureau of Foreign and Domestic Commerce, the leading aircraft exporter is the United States.

SBAC is not stopping its campaign with the issuance of high sounding announcements to press services and it is not depending on past performances to produce the desired business volume. The British organization is mapping a carefully planned program of economic conquest.

Branch offices of the SBAC export section are being opened in many of the major business sections abroad, particularly in the dominions, India, the Far East, Latin America and the Middle East. "Trade ambassadors" will head each of these offices.

Agents of the British aircraft industry as a whole, these "ambassadors" will be expected to enhance the reputation of the home products. They will have a thorough knowledge of the British aircraft industry as well as a schooled background in the country to which they are sent. They will not actually sell aircraft. Their job is more in the line of promotion. The actual contracts will be made by individual company representatives.

The British government is standing behind the scheme and has assured the

N EXPORT BATTLE

Transport development in Britain lagged during war. Avro Tudor I (top) has been tested; deHavilland Dove has also flown.

SBAC that help and co-operation will be forthcoming from appropriate governmental departments. Thus, the trade ambassadors have the political as well as financial help of their government.

Compared with the British export program, the American position is still undeveloped except that a few individual companies are doing some foreign advertising. From an organizational standpoint, the relationship between the Aviation Industries Association and U. S. aircraft manufacturers is the same as that between SBAC and British plane builders. However, the British use the SBAC as a common channel for all export activity and U. S. manufacturers to date have preferred to work independently.

The AIA export staff supplies U. S. industry with world trade reports as complete as those prepared by SBAC's export section. That information includes our

(*Continued on page* 78)

AIA export committee, which supplies world trade reports to U.S. industry, at New Jersey meeting.

Household goods and garden tools are loaded on Conestoga, one of five used by Flying Tiger Line in its "on-call" operations.

THE FLYING TIGER LINE

'We haul anything anywhere' is the motto of former AVG pilots who, with war-surplus Conestogas, have pioneered a unique air-cargo service.

By TOM CAMERON

LIKE many other Army and Navy pilots, Robert W. Prescott dreamed of having his own airline some day. He thought about it while flying a *Warhawk* for the Flying Tigers over China. He talked about it with people in Kunming, Karachi and other places around the globe.

But unlike most of the pilots, whose dreams never came to be more than dreams, Prescott did get his airline. His personnel is mostly former wingmates and groundcrewmen from the American Volunteer Group, and while the official name of the company is the National Skyway Freight Corporation, it is more often called, appropriately enough, "The Flying Tiger Line."

The Flying Tiger Line is a non-scheduled operation. In its big stainless steel *Conestogas* it will haul anybody or anything anyplace in the United States.

The people Prescott talked with around the world doubted that a non-scheduled freight line could be made to pay off commercially. For the first month, when the Flying Tigers ran pretty deep into the red, Prescott had his doubts too. But the line was a little less in the red the second month, and by the third month of operation, it had inched a tiny bit into the profit columns. But this is getting ahead of the story's chronological development.

When Prescott got back to the states he began writing former fellow Flying Tigers and Hump pilots. He explained that he was going ahead and wanted funds and trained personnel with which to start his non-scheduled, contract freight line.

Prescott had learned that the Edward G. Budd Manufacturing Company had built the two-engined, stainless-steel, all-welded freight airplane called the *Conestoga*, designed for use in the tropics where short runways at high elevations are the rule. The Rubber Development Corporation was scheduled to use them in Central and South America but the Navy had stepped in, commandeered the project and upped the order to 900 airplanes. Seventeen had been built when the Navy abandoned the whole thing and the completed airplanes, together with 22 carloads of parts, were offered for sale by the War Surplus Property Board.

Robert F. ("Duke") Hedman who, like Prescott, had shot down six Jap planes, went in with $10,000. Joe Rosbert, also with six air victories, matched Hedman's investment; J. R. ("Dick") Rossi, another six-plane man, threw in his savings, as did other AVG and CNAC pilots, until Prescott had $87,000.

Prescott had met Robert L. Smith, president of the Los Angeles Airport Commission and business manager of the Los Angeles *Daily News*. He went to Smith, told him his plan, his progress in financing and of the opportunity to buy ideally-designed new airplanes.

Smith introduced Prescott to Samuel Mosher, oil company president who is interested financially in Aztec Aircraft Corporation, operating out of Mexico City. Mosher became enthusiastic over the plan and advanced a sizeable sum. This, with other investments, matched the pilots' $87,000.

Hustling to Washington, Prescott exercised his veteran's priority and bought the 14 *Conestogas* and the 22 carloads of parts from the Government agency for $401,000. He paid $90,000 down and the Bank of America financed the balance. It now holds a $58,000 mortgage.

Prescott sold four of the *Conestogas* to Shell Oil Company for use in Central and South America, and two to Mosher's Aztec. That left only seven flyable planes, since one of the remaining eight is a prototype which must be rebuilt. One of the seven burned in a recent take-off crash and another crashed recently in New Mexico.

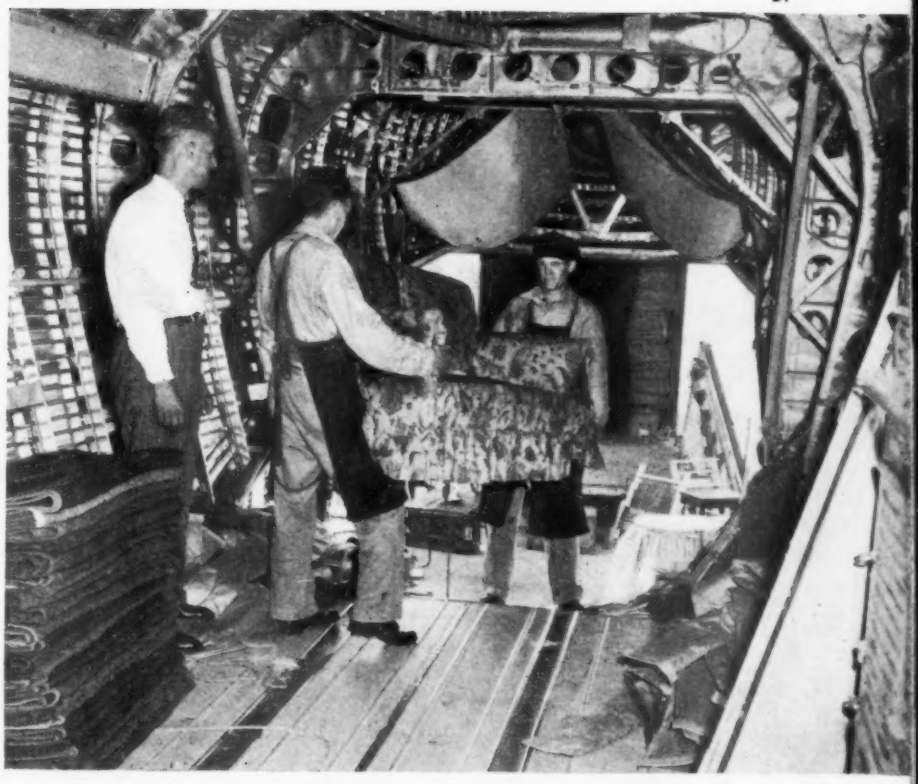
But Prescott made $80,000 profit on the six planes he sold and recently purchased five *Skytrains* from the Reconstruction Finance Corporation.

What were the initial prospects?

Prescott had based some of his faith on a survey by the Division of Marketing and Transportation Research of the Bureau of Agricultural Economics, U. S. Department of Agriculture. This agency estimated that fresh fruits and vegetables constitute a potential air cargo of 5,000,000,000 ton-miles annually.

L. H. Brittin, director of the Edward S. Evans Transportation Research, recently asserted that "if we assume that only one-

(*Continued on page* 70)



Cargoes such as household furniture are flown on charter basis at a coast-to-coast rate of 30 cents per ton-mile, or $1,600 per capacity load. Line made profit in third month of operation.

Lacking airline priorities, Navy men on leave chartered five Conestogas to fly them home. The cost was $2,300 per plane or $95.83 per man. Planes have CAA certificates for hauling passengers.

Standing directly behind a group of antiaircraft gunners, the "pilot" of this radio-controlled Army-designated OQ-2A plane, by maneuvering a stick no larger than a pencil, can simulate any kind of plane maneuver to help gunners develop their skill.

By EDWARD CHURCHILL

Highest development of radio-controlled aircraft, target planes helped train thousands of AA gunners.

IT WAS a strange scene. Speeding through the sky at better than 140 m.p.h. was a pilotless little (12-foot span) radio-controlled target plane. On the battleship, crews were firing up to five-inch guns in a futile effort to bag it. Deftly, it threaded through the metal hurled at it for more than half an hour.

Operated from a small AVR (aviation rescue) boat near the battleship, it had been launched from a small catapult. An officer stood on the deck manipulating what looked like a pencil stuck in a cigar box. By pushing this pencil, in reality a control stick, forward and backward he maneuvered the target plane up and down. By pressing it to one side or the other he banked it right or left. Near him a compact transmitter sent controlling radio impulses to the plane's receiver.

The craft gave the gunners everything they could expect from German or Jap. *Kamikaze*? Stick forward, with plane hurtling down at battleship. Torpedo attack? Here it comes hurtling in from the side. Mast high? It shoots over the deck. High bombing run? Up into the sky, a pin-point.

Practice ends. The "pilot" presses a button on the control box's side and a 24-foot parachute billows. As it hits the water, the AVR boat picks the plane up. Allowed to dry, inspected and tested in the AVR shop, it is soon ready to fly again. During the war this scene was repeated thousands of times on land and sea as thousands of gunners practiced.

The little plane had been manufactured by volume production methods on progressive production and assembly lines. Sub-contractors had supplied many of its parts. A subsidiary company had built its 22-h.p. two-cycle, two-cylinder opposed engine. It had been delivered to the Navy by the Radiophone Company, Metropolitan Airport, Van Nuys, Calif.

A total of 16,440 planes have come off

A radio-controlled Navy target drone (TDD) takes off from a regular ship's catapult using a much reduced firing charge. The drone gives gunners practice on every maneuver they could expect from an enemy—torpedo attack, high bombing run, or Kamikaze.

Radioplane lines and more still are being built for the Government. Cost of the first models was $4,000. By 1943 they were being delivered for $994 and the current price is less than $600.

The little plane is the daddy of all radio-controlled aircraft. The radio control device, with four channels added to operate throttle and brakes, has been adapted by the Aircraft Radio Laboratory at Dayton, O., to allow pilotless operation of the Culver target plane and the Bell jet-propelled *Airacomet*.

Behind its development for Army and Navy is perseverance, American ingenuity, a long financial gamble and engineering brains.

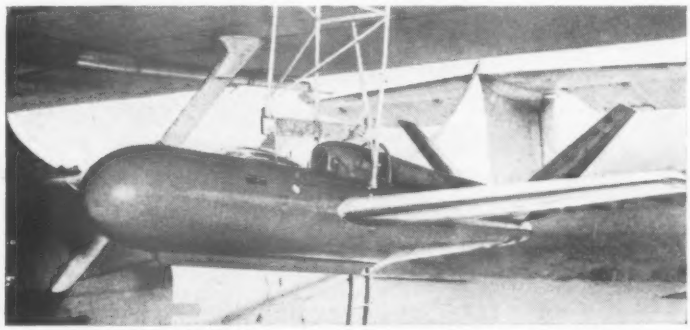
"It's oddball," AAF observers said when the original model was tested in 1935 and crashed. "But maybe it has a chance."

The idea for a pilotless radio controlled target plane came to Reginald Denny, a Hollywood actor. He believed it would work; that it could be produced cheaply,

When practice is over, operator presses a button which shuts off engine and releases parachute, permitting plane to land. Equipment is water-proofed so it can be used again.

OTHER TYPES OF ROBOTS

"Mother" planes are used to direct larger drones. Here Douglas Dauntless controls Culver TDC which will seek to evade ship antiaircraft fire.



Jet-propelled radio-controlled drones, faster than conventional robots, also are used for gunnery training. This is attached to Catalina wing.

Workers assembling parts of radio-controlled planes at Radioplane Company where 16,440 robot aircraft have been built and more are in production for the Government.

that it could be simple in construction, that it would eliminate expensive man-sized target towing planes.

British-born Denny, who served as an observer with the RAF during World War I, became one of the film colony's highest priced stars, lost almost all of his money in oil and mining stocks and then started a general model business.

Though a sportsman pilot, he was more interested in model airplanes. There were his *Dennyplane*, a model of approximately five-foot wingspread with an engine specifically designed to power it, and the *Dennymite*, with a 1/5-h.p. Walter Righter engine.

Expansion was eating up Denny's remaining capital when he interested the Whittier estate in what later became known as Reginald Denny Industries, Inc., and N. Paul Whittier, scion of the famed pioneer California family, became his associate. Together they determined to build a radio-controlled plane.

Denny, Whittier and a young radio and electronics engineer, Kenneth Case, struggled and experimented for several years, developing, with the aid of Righter, a gasoline-driven model airplane which had some semblance of radio control. The main trouble with the prototype was that it took the "pilot," operating the controls through the use of dials similar to that on a telephone, too long to get control reaction.

Between the time the "pilot" started dialing a change of direction and the time the plane responded, it usually crashed.

This airplane, known as the RP-1 (Radioplane One), cruised at approximately 50 m.p.h. It had a nine-foot wingspan and was of balsa and plywood construction. It was powered by a Righter 2½-h.p. two-cycle, two-cylinder opposed engine.

Following the 1935 test and crash, Denny and his associates were awarded a contract for the construction of three experimental target planes which, if they met specifications, would be bought for $11,000.

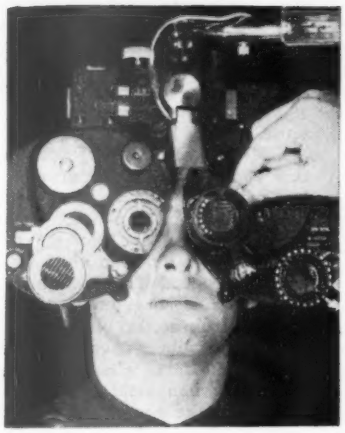
At this time, the fundamentals of the control system were there—the dial box control, the very high frequency radio transmitter and the receiver-selector in the fuselage of the plane. A 73 megacycle carrier wave was modulated to five audio frequency waves—one wave each for up, down, right and left and one for normal flight. The "pilot" wore earphones, five different tones telling him which wave was affecting the plane.

The second experimental plane, finally completed in March, 1939, had a square fuselage of basswood construction. It was slightly larger than the RP-1. It was successfully test-flown by Denny, Whittier, et al, on the California desert.

In November, 1939, a third experimental plane, known as the RP-3, was finished. In this plane welded steel tubing was pioneered. It had a square fuselage and a single propeller. (Later, on some models, counter-rotating propellers were used to overcome torque effects).

Another feature of this craft was the installation of the landing parachute. Denny is credited with the original idea, with

(*Continued on page* 112)



Author says these elaborate tests do not gauge long-range acuity of sight.

THE EYE-TEST FALLACY

By LEON J. ALGER, M.D.

Ophthalmologist and private pilot, Grand Forks, N. D.

Do present depth perception tests actually measure vision?

YOU are sitting 20 feet away from an apparatus and peer into an opening in its end. Within you see two black pegs and, by the aid of two long strings, one held in each of your hands, you move one peg back and forth until both appear to be opposite each other. You are not doing so well. The doctor finally decides that since you cannot accurately place the pegs side by side you will never make a safe pilot.

Is the doctor correct in turning you down? Up until June 1, 1945, no one could get even a private pilot's license without passing this visual test. It is still required for a commercial license. Now the question arises: how much is accomplished by making this test? Is it truly a test of depth perception? The RAF discarded it five years ago; should we?

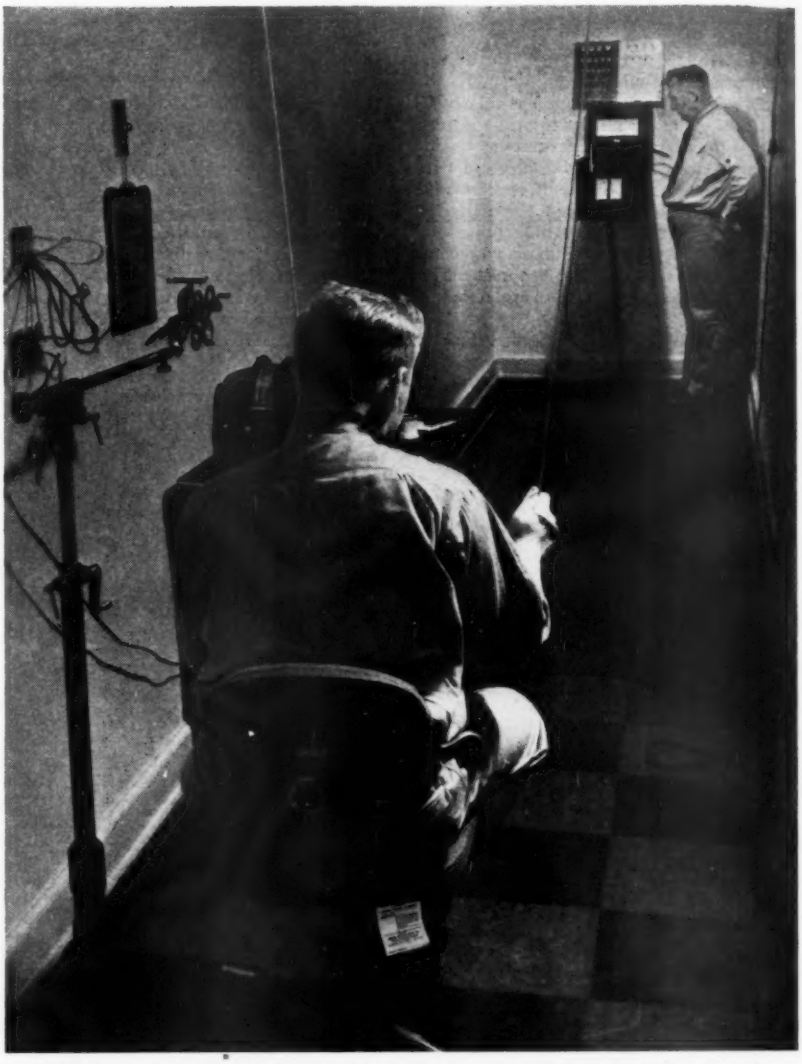
To begin with, there are no less than nine different sensations which give us a sense of depth or distance:

1. *Distance as interpreted from size:* If you know how large an object is, you can determine its distance to a great extent by noticing how large it appears to be. If you see a plane of a known kind flying overhead, you can judge its distance by the size it appears to be.

2. *Intervening objects:* Throw a stick into a still pond and try to determine how far it is from you. Throw another stick along shore and try to do the same. Your estimation of the distance to the stick along the shore will be much more accurate than your estimation of the distance to the one in the pond. Beach toys, the sun umbrella and the boat dock create "perspective" between you and the stick along the shore and allow you to determine distances here much more accurately than to objects in the pond.

3. *A real perspective:* This means the change in color and softening of outline that occurs at various distances. If you see two planes up in the sky and one is bluish and indefinite in outline, you know that it more distant than the other plane whose colors are distinct and whose outline is clearly defined.

4. *Geometric perspective:* This offers a



The pins-in-a-box test for stereopsis is really a muscle sense test and is not related to piloting, declares Dr. Alger. With one good eye and some trickery, any applicant can pass it.

factor of great importance. Parallel lines, as they recede, appear to converge toward the line of vision and parallel planes appear to intersect in the plane of the horizon. This factor explains the striking illusions of size and distance that we gain from looking at an airplane with tapered wings. We do not have sufficient experience to be able to judge just how much of this tapering is due to the "foreshortening" of distance, and how much is due to the tapering of the wing from actual design. Consequently, when we view a transport plane from its side, we often have a feeling that it has practically no wing at all. No such sensation is experienced when looking at the non-tapered wings of the average private plane.

5. *Distribution of light and shade:* The distribution of light and shade upon a body frequently tells us its relative distance from another body. This is beautifully illustrated by a landscape at sunset. The shadow effects brought about by the setting sun lend a landscape depth and perspective which is quite lacking at mid-day.

6. *Motion:* As you come in for a landing, you look out ahead probably anywhere from 50 to 150 feet, depending upon your habits and training. What do you see? Motion!—and that is nearly all you see. You do not have size to guide you as to distance. The runway is too broad to scan its entire width, and usually there are no objects of recognizable size from which to judge the distance. There also are no intervening objects to give you perspective. But as you come nearer and nearer, the ground moves faster and faster until you are about to touch it.

The question will be asked, "How do you know it is not the plane that is going faster?" In the first place, you will have trouble in a plane with a decidedly different landing speed from the one to which you are accustomed. But even so, you experience a sensation which provides a clue, for the higher you are the more *uniform* is the speed of objects directly beneath you and objects 200 feet ahead of you. As you approach the ground, objects directly beneath whiz by in a blurred streak, while those farther out in front move relatively more slowly.

Thus the sensation of distance from motion is much more complicated than this. Further details of the art of determining the distance to the runway was simply, yet scientifically explained in the article, "Can I Land?", FLYING, July, 1945.

7. *Accommodation:* If you look at a distant object, near objects are blurred. Likewise, if you look at a near object, distant objects will be blurred. This occurs because the eye must focus differently for various distances to bring the image clearly upon the retina, just as a camera must be focused differently for various distances to bring the image clearly upon the film. This becomes a habit so that one subconsciously learns to estimate the distance to an object by the way in which the eye focuses upon it. This sensation is only of value in judging distances of 10 feet or less because for greater distances little accommodation is necessary.

8. *Stereoscopic influence of dissimilar images:* This is produced by the difference in the position from which the two eyes view a single object. Hold a pencil two feet in front of you, now look across a desk littered with objects, fixing your gaze on an object on the floor. If your eyes are normal you will see two pencils, and if you will observe carefully but continue to fix your gaze on the object on the floor, everything on the desk in front of you is double, also. This doubling of images, called stereopsis, gives you a sense of "depth."

9. *Muscle sensation of position of the two eyes:* Now hold your pencil about two feet away and touch the end of the pencil with another pencil. Try the same thing with one eye closed. It will be found that you can do much better with both eyes open. This is because the two eyes are at certain angles to each other as they look at the ends of the pencils. When you subconsciously feel that the angle is the same when looking at pencil No. 1 as when looking at pencil No. 2, you know the pencils are the same distance from your eyes.

These last two sensations, Nos. 8 and 9, are of great importance for judging short distances, but in flying they are of little importance *because they do not help for distances of more than 15 to 20 feet.* The stereoscopic sensation is extremely inaccurate. Try it for yourself. Again throw a stick about 20 feet out into the lake. Now place another stick upright in the sand in front of you, more or less in the line of vision. Does the upright stick help you to judge the distance to the stick in the lake? The answer is definitely no!

Now consider the value of sensation No. 9. If you are looking at an object 15 feet away, the angle subtended by the line of vision between the two eyes is only ⅔ of one degree. If you move the object five feet farther away, this angle will change *only 1/15 of one degree.* One might imagine that the eye can detect 1/15 of one degree of change. You can determine that for yourself, too. Ask your oculist if he will loan you a prism of one "dioptre." One dioptre is half a degree and is probably the smallest he has. Now suspend an object from a string into open space so that other factors of distance will be at a minimum. Stand 15 feet away from the object and place the prism "base in" in front of one eye. Try it again, "base out." This prism is 7½ times the change in angle that you would get from moving back or forward five feet. Yet, can you notice if the object appears closer or farther? Have a friend hold the prism for you without telling you which way he is holding it. Can you even tell any difference in the sensation of distance as he holds it base out or in?

I doubt if any one can discover by himself, simply by trying the prism before his eyes, whether base-out or base-in prism is supposed to make an object look closer. Purposely, I have not told you which is which.

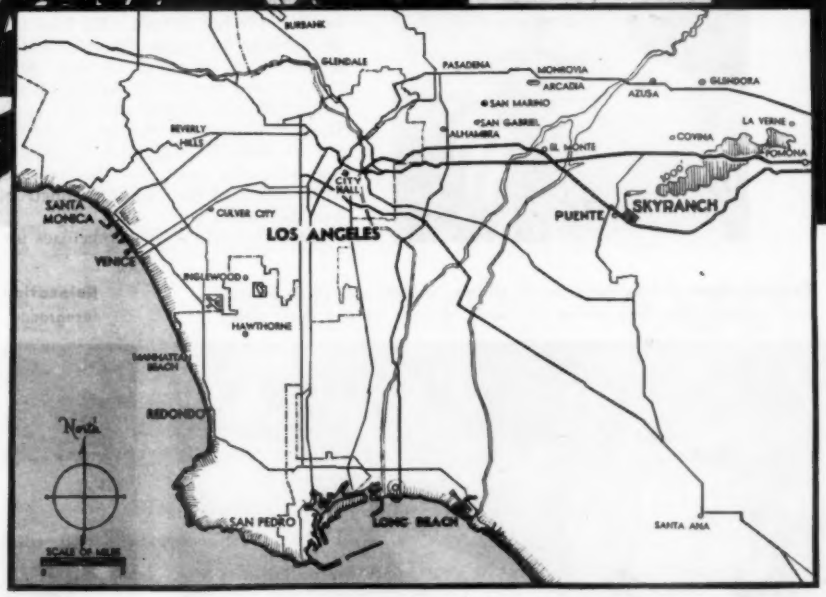
The point is that sensations No. 8 and 9 are of absolutely no value for objects over 15 feet away. Yet the pilot, who is dealing with objects at a *very minimum* of 15 feet, is tested *only* for sensations eight and nine—the very ones which are of no importance to his flying technique. As a matter of fact, the depth perception apparatus does not even lend itself well

(*Continued on page* 116)

Not a test for long range vision, says the author, the accommodation test is only of value in judging distances of 10 feet or less. Another time-wasting device for pilots?

Skyranch

Open-air snacks are popular, despite occasional dustings from taxiing planes. Bicycles are provided for visitors to tour Skyranch.



Skyranch is about 17 miles east of Los Angeles city hall, 3½ miles north of CAA airway.

By LOUIS BANKS

Mix some money, foresight and business ability and you get this kind of an airport

SKYRANCH is a 160-acre airport 22 miles east of downtown Los Angeles, where airplanes and beefsteak, ground school and parties, solo checks and ping-pong all have something in common.

That "something" is service for the private pilot—and for any of his relatives and friends who might want to relax while he shoots landings or flys cross-country to the vicinity of Big Bear Lake.

In the concept of Skyranch, Inc., the word "service" is rooted in the traditional idea of safe, carefully-maintained flight operations. It also embraces plans for such novel ideas as a dormitory for summer flight-school students, a physical education program for young pilots, a swimming pool, a first-rate dining room, recreation, drive-yourself cars and perhaps even an entire suburban residential district—all centered around the modest lightplane and aimed at making normal aircraft maintenance less expensive for the private pilot.

Skyranch is operated by a Hungarian-born, French-educated American named Ettienne Noir. Noir scouted southern

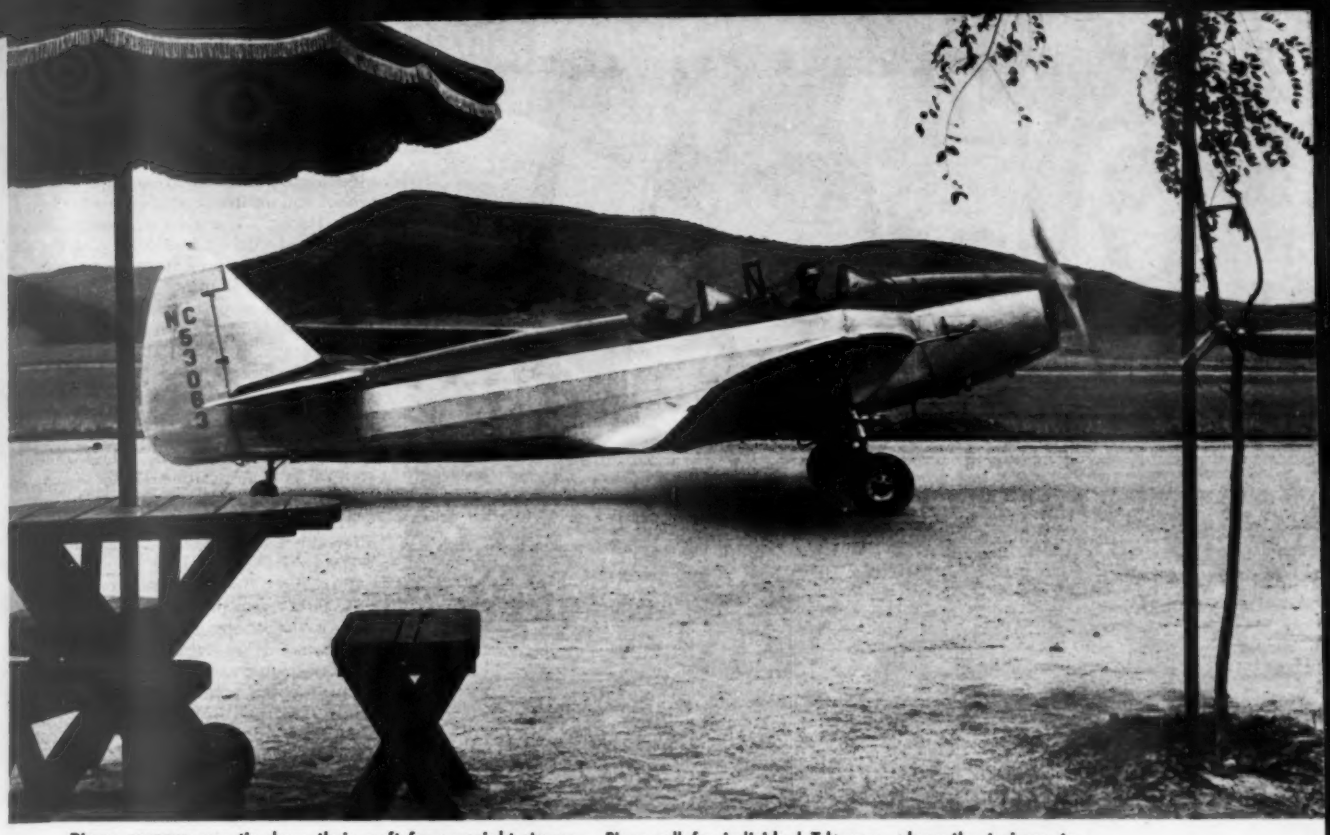
Single-runway Skyranch, with its parallel taxi strip, is on highway between Puente and Walnut. This scene is looking toward Puente Hills. Etienne Noir (left) is general manager.

California for eight months studying private airports and searching for a strategic location for his project. He found it in the acreage adjoining Puente, Calif., and secured the approval of Los Angeles County and the Civil Aeronautics Administration to start work on his runway. The first plane took off from the 3,000-foot granite strip July 21, and the Skyranch was officially open for business even while much of the building construction was still under way.

The lightplane pilot who cruises up the rolling Puente Valley to land at the Skyranch today will find four buildings and field facilities that represent an investment of about $117,000. He'll be met and brought to the chocks by an attendant and his plane will be checked over free-of-charge while he relaxes in the bungalow-type administration building, has a game of ping-pong in the adjacent recreation building or sips a cup of coffe under one of the red and green beach umbrellas at an outdoor table in front of the coffee-house. He'll also find an area graded for

Control-room girl operates public address system, calls plane owners and students when their planes are ready, records training flight time.

Relaxation for students and visiting pilots is provided at tables in foreground and at lunch counter in left background. Flyers also



Plane owners now tie down their craft for overnight storage. Plans call for individual T-hangars along the taxiway, to be leased at standardized monthly rates. The San Jose Hills in background are 600 feet above Skyranch altitude.

a 100x100-foot hangar. Until the hangar is completed, mechanical work is done in a small garage-sized shop.

Noir plans that by late summer the completed Skyranch—a $411,000 investment—will include an operational hangar, an administration building with everything from an information booth to a postal sub-station; a resident school for 75 summer-school flight students; a clubhouse atop a 150-foot hill; a 24-unit auto court for overnight guests; a swimming pool, a tennis court, archery range—and, in all probability, even a prospering farm.

In Noir's estimation, these non-aviation enterprises will (1) provide an all-accommodation base for the sportsman pilot or the feeder-line operator; (2) produce enough profit to make plane maintenance less expensive for the lightplane pilot, and (3) bring the Skyranch an eventual annual profit of $46,800.

With one eye on ground-business possibilities and the other on safe aviation, Noir and his associates chose the site at Puente. From an aviation standpoint the choice seems wise because the acreage is removed from the Los Angeles metropolitan haze belt. The surrounding country is open and well-adapted to amateur forced landings. There is no air traffic congestion and the prevailing wind, usually gentle, points the windsock right down the runway. Although the Puente Hills rise 200 to 300 feet just north of the field, Noir has printed, and intends to enforce strictly, a traffic pattern that requires all turns to be made away from the hills toward the open valley. From a

have access to game room, reading room and clean rest rooms. Completed Skyranch, as now planned, will cost more than $400,000.

Restaurant at east end of administration building is screened-in, has tables and counter stools. Railroad station is 600 feet from airport.

Before taking off to practice spins, Chief Pilot Art Soare tells a student what he plans to do in the air. Noir also operates another flying school at Rosemead airport, 8½ miles away.

Visitor's planes are stored in tie-down area east of administration building. Maintenance work (below) is done outdoors temporarily. Free inspections are a regular Skyranch service.

business standpoint Noir's choice of a site seems even better. Sloping hills will provide a romantic touch for the summer-school and an interesting locale for horseback riding. The Pacific Electric Motor Transit interurban bus rolls past the administration building from downtown Los Angeles every 40 minutes and a Southern Pacific train stops in Puente twice daily. Work already has begun on nearby Puente race track, owned by the Southern California Jockey Club, a $2,500,000 enterprise. Its 35-day season brings promise of many a visit from air-minded race fans who might fly in from San Diego, Glendale, San Bernardino or other southern California communities. If they come by automobile on Valley Boulevard, a link in a main east-west highway, Noir plans to offer the facilities of his service station, restaurant and motel.

But where does the plain, ordinary private pilot come in?

He's to benefit from lower rates for aeronautical services. Noir knows the pilot's problems and his pocketbook qualms because he organized and heads Club Aero, an organization of private lightplane pilots and owners designed to offer flying at co-operative rates. At Skyranch, lightplane owners will be assessed a tiedown fee of $10 for one month, $100 for one year, $150 for two years, or $180 for three years. On the three-year basis the cost will be $5 per month, compared with the current average tie-down cost in metropolitan Los Angeles of $15 per month.

Plane owners will have an opportunity to do their own maintenance work using Skyranch equipment and under Skyranch supervision if they desire. Those owners holding three-year tie-down contracts will receive maintenance on a cost-plus basis.

Included in Skyranch plans is one "must"—cleanliness. Noir intends to eliminate the necessity of a private pilot's wife picking her way carefully among the workstands and oil cans or looking away quickly from the grimy pinups of the average airport. Maybe the veteran lightplane pilot will miss the fly-specked, greasy windows and the hard benches, but Noir is willing to risk his $411,000 investment that the average lightplane pilot will find flying a lot more fun on the country-club basis.

To prove the accuracy of his financial predictions, Noir points out that he was interested in a summer school at Lone Pine, Calif., in the Owens Valley, which sold $8,494 worth of flying time between June 2 and November 30, 1944, even though every student had to travel 400 miles round trip on weekends.

Behind his decision to risk everything on the Skyranch lay Noir's months of patient investigation of all angles of the airport situation.

"Southern California, especially Los Angeles County, can conservatively look forward to 15,000 privately owned airplanes by 1950," he estimates. "Since none of the airfields is large enough, and that includes ours, to handle more than 200 airplanes, we will require 75 airparks to take care of the minimum demands.

(*Continued on page* 90)

BETTY

Bettys were work-horses of Jap air force, serving as medium bombers, reconnaissance and transport planes. Above, occupation force GIs inspect unfinished Bettys inside Nagoya's Mitsubishi factory.

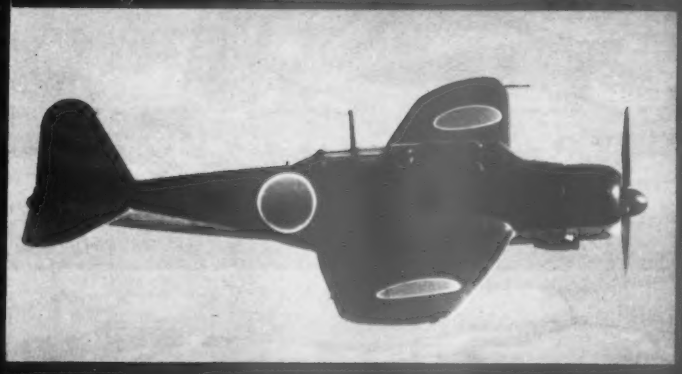
Were Jap aircraft inferior? Ask the men who fought them.

HOW GOOD WERE JAP PLANES?

WHEN the Nips pulled their sneak raid on Pearl Harbor December 7, 1941, the United States received its first glimpse of modern Japanese aircraft. The fruits of a now obviously well-planned aircraft production program—*Zekes, Vals* and *Kates*—were used in this raid and clearly showed that the old *Claudes, Nates,* etc., the Japs had been using against the Chinese for five years or more were not their best aircraft. During 1942 and 1943, Navy pilots saw an ever-increasing number of new planes which bore further evidence that the Japs had launched a strenuous aircraft building program.

The Japs proved their prowess in building aircraft. When they surrendered in August, 1945, they had about 30 first-line and 15 second-line aircraft in operation. An additional 20 were under experimentation, some of which would certainly have reached combat operations this year had not *Superforts* smashed the production lines. It is not definitely known how many aircraft the Japs built between 1939 and August, 1945, but a reasonable estimate is about 70,000 combat and transport types. The greatest production year was in 1944 when approximately

JACK Standard Navy fighter



KATE Carrier-based torpedo-bomber

TONY Only in-line fighter Japs used

JILL Carrier-based torpedo-bomber

FRANK Fastest Jap fighter

25,000 planes were flown to various Jap-controlled airfields. This was 10 times the number produced the year before the war.

In retrospect, it can be seen that the Japs were ingenious, ambitious and progressive in aircraft design and production, even though American mass production methods and generally all-around superiority finally grounded their air force in August. The Japs improved their aircraft all during the war trying to lessen the advantage American engineering minds gave to U. S. planes. The Japs developed more powerful engines, more firepower, added armor plating for pilot protection, and finally perfected self-sealing gas tanks. A host of

NICK Twin-engined fighter

ZEKE Single-engined Army-Navy fighter

JUDY Single-engined dive-bomber

GEORGE Jap's best Navy fighter

OSCAR High-altitude Army fighter

Jap aircraft were captured on Clark Field in the Philippines and, in the judgment of the American test pilots who flew them, they were very good aircraft.

Tracing the historical development of the Jap air force it can be readily seen now that the militarists fully realized they needed a powerful air force to accomplish their Greater East Asia Co-prosperity Sphere aims. Considering the size of the empire, the Japs' aircraft production program was large. While they could not compare with the U. S. potential, nevertheless they developed a substantial airpower which was larger and far more diversified than the laymen in this country generally believe existed. Let's review the kind of competition

TABBY Twin-engined cargo transport

IRVING Twin-engined night fighter

DINAH High-speed reconnaissance plane

BAKA Piloted bomb

that both American and British pilots ran into in the Pacific.

FIGHTERS: The Jap navy ran more of the show in the Pacific than the army; therefore, navy planes played a more dominant role. The most widely used Jap aircraft was *Zeke*, referred to early in the war as the "Zero." About one-third of the Jap fighter strength was *Zekes* as the war ebbed. The first model was used against the Chinese in August, 1940. It was succeeded the following year by an improved version which became operational in large numbers and gave the Japanese a superior first-line fighter. Capable of 326 m.p.h. at 16,000 feet this *Zeke* was probably the most maneuverable combat plane in the world. It definitely taught U. S. (*Continued on page 72*)

By FRANKLIN D. WALKER

THE West Coast is excited about Lockheed's two-place personal plane, the *Big Dipper,* a company "secret" shared by hundreds of persons who witnessed the craft's two-hour taxi tests at Lockheed's Burbank air terminal early in December. It is now undergoing flight tests at Muroc Dry Lake.

The excitement stems not so much from the off-conventional design as from the report that Lockheed hopes to keep the plane's weight down to 750 pounds and its selling price to about $1,500. If those two objectives are reached, Lockheed may move to the front of the lightplane field.

The *Big Dipper,* a pusher type, is a modified version of the *Little Dipper,* a single-place job Lockheed sought unsuccessfully to sell to the military as a reconnaissance plane. At first glance it looks like a conventional lightplane, but there are notable differences. The engine is located in the fuselage back of the seats, and an extended drive shaft turns the propeller in the cone behind the tail assembly.

The empennage is orthodox, except for the addition of a small vertical fin projecting below the horizontal stabilizer which apparently also serves as protection for the propeller in the event of a tail-down landing.

Tricycle landing gear and the same type of flap used on the *Little Dipper* are incorporated in the *Big Dipper.* These flaps enabled the *Little Dipper* to land at 35 m.p.h. in 100 feet. The *Big Dipper* is well streamlined and has a clear-vision canopy that is nicely faired into the fuselage.

Florida Court Opinion

The Florida State Supreme Court has issued an opinion that will be cited many times in the immediate future in cases involving a municipality's right to zone out small airports as nuisances. The opinion reversed a circuit judge's decision upholding the Dade county commission in zoning out Carl Stengel's proposed private plane airport, and said in part:

"In almost every town of any consequence in Florida for more than three years the sound of airplanes has been almost incessant as men trained in them for the very purpose of safeguarding the constitutional guaranties, including the one that a person may not be deprived of property without due process of law. Airplanes are not mere noisy nuisances, nor vehicles still in the experimental stage. They represent the latest means of transportation, and certainly if we are to progress, the establishment of airports to accommodate them should be encouraged."

The opinion was issued with an order granting Stengel the right to take his fight against the commission to the state's highest court. It is hoped that the loser there will carry the case to the U. S. Supreme Court for final determination.

The Last Bouquet

Gaither Littrell, West Coast editor for FLYING, recently in Honolulu and a guest of Admiral Reeves, skipper of NATS (Naval Air Transport Service), returned with an excellent bit of verse, entitled "The Last Bouquet," that is making the rounds of the Pearl Harbor station. The author is anonymous. It goes like this:

"I've flown 'em all from now to then,
The big ones and the small;
I've looped and zoomed and dove and spun,
And climbed 'em to a stall.
I've flown 'em into wind and storm,
Through thunderhead and rain,
And thrilled the folks who watched me roll
My wheels along their train.

"I've chased the steers across the range,
The geese from off the bay.
I've flown between the Princeton towers
When Harvard came to play.
I've clipped the wires from public poles,
The blossoms from the trees,
And scared my best friends half to death
With stunts far worse than these

"The rules and codes and zones they form
Are not for such as I,
Who like the great wild eagles fling
My challenge to the sky.
A bold free spirit charging fierce
Above the fallow land . . .
And don't you like these nice white flowers
I'm holding in my hand?"

Odds and Ends

North American's four-place private plane has a tail very much like that on the *Mustang,* and a big bubble canopy which slides aft for passenger entry and exit. Power plant probably will be a 120-h.p. Continental. The rear seat, designed for two, is roomy enough for three. Luggage compartment is behind the second seat. Tooling for this plane is under way and the prototype is scheduled to fly by mid-summer.

Although the topside management of Grumman Aircraft has not decided whether the company should enter the personal plane field, research is going forward on two small planes. One is a three-place, spot-welded amphibian with a 100-m.p.h. cruising speed which looks like the Republic *Seabee.* The other is a two-place, twin-tail land plane with the familiar Grumman squared-off wing tips.

Aeronca, Piper and Taylorcraft have four-place planes on their designing boards, all low-wing jobs. Piper's plane, which will have metal skin and retractable landing gear, probably will fly by early spring; the Aeronca is now in mock-up and the Taylorcraft may not take to the air before late summer.

Horsepower of the Commonwealth amphibian will be upped from two 75-h.p. to two 85-h.p. Continentals before the plane is NC'd, increasing cruising speed well above the present 100 m.p.h. Commonwealth's other personal plane, the *Skyranger,* is tentatively priced at $2,850.

Republic's *Seabee,* in production in the same plant from which will come a new jet fighter and the *Rainbow* transport, now has a 220-h.p. Franklin engine . . . Cruising speed of Bellanca's *Cruisair* probably will be raised to 140 m.p.h. with the jump to a 150-h.p. power plant . . . Cessna has two new models in the mill, a five-place and a two-place. The larger plane will not have retractable gear.

Notice To Airmen

Credit for the new bi-weekly Notice to Airmen (it now includes NOTAM, the directory of airfields and air navigation radio aids) should go to Richard J. Aubry, chief of flight information division of CAA and also a pilot, who edited the material for years and crusaded for the new edition almost as long. Aubry roused the interest and suspicions of old-line Government workers when he advocated the change, contending it would mean an annual saving of $75,000, as well as 36,000,000 sheets of paper. Besides, he argued, it would give the pilot one publication which would contain flight information on the entire country, brought

(*Continued on page* 98)

Canada's

Surplus Tiger Moths will be planes mainly used by the Royal Canadian Flying Clubs Association. Several hundred have been purchased from Canadian War Assets Association for $460 each and are being overhauled at central delivery field, Oshawa, Ont.

By JAMES MONTAGNES

Royal Canadian association will start flying this summer with several hundred Tiger Moths.

UNTIL the war brought a ban on private flying in Canada from September, 1939, to August 15, 1945, most private flying was in conjunction with a government-sponsored group of flying clubs in principal cities stretching across the country. Now flying clubs are preparing once again to resume their operations, and it is hoped that by the summer of 1946 most of the 30 clubs presently forming the Royal Canadian Flying Clubs Association will be in operation.

Student club-members will fly De Havilland *Tiger Moth* single-engined open biplanes used by the Royal Canadian Air Force as elementary trainers and which were standard equipment of most flying clubs before the war. The RCFCA clubs have purchased several hundred of these aircraft, with a full stock of repair parts, from the Canadian War Assets Corporation at an average price of $460 each. At the central delivery field, Oshawa, Ontario, the association is now busy getting the planes into shape for resale to the individual clubs. Under the terms of purchase from WAC, the association is limited to reselling the aircraft to the individual clubs at cost plus a reasonable charge for overhauling and repairs.

When the flying clubs started in 1927, the government made grants of one aircraft for each aircraft purchased. Then the basic idea behind the clubs was to build a nucleus of pilots for the RCAF. The plan has paid good dividends, for the clubs supplied large numbers of wartime pilots. Many commercial pilots first learned to fly in the clubs.

The need for training pilots for the RCAF naturally is not as great today as it was in 1927. Close to 100,000 young Canadians are now qualified RCAF pilots. Thus, the government no longer feels the need to sponsor the flying clubs with grants of planes or money for each pilot trained as it did before the war. The post-war flying clubs, however, expect to stand on their own feet and to finance

Flying Clubs

During the war, flying clubs belonging to the Canadian association formed limited non-profit-sharing companies and operated elementary flying schools for the RCAF from their own fields. With war-earned profits, the clubs now are reconverting to civil flying.

themselves through membership and operations and the money earned during the early war years in training RCAF pilots.

When Canada entered the war, the RCAF was too small an organization to undertake training all the pilots it would need within its own organization. And so the flying clubs, through their association, were called on to help. The clubs quickly formed limited non-profit-sharing companies and operated elementary RCAF training schools from their own flying fields. The government supplied the aircraft and, in many cases, the financing, supplementary equipment such as hangars, overhaul facilities and whatever else was necessary. The club-schools supplied the fields, personnel and instruction. Since some of the clubs were too small to handle a school alone, in a number of cases two or three clubs in the same locality pooled their resources and equipment and formed one complete school. By early 1940 the schools were turning out RCAF recruits as pilots on a production scale, with some of the pilots in turn becoming instructors.

A number of methods of paying the club-schools were devised, varying from year to year, until it was finally decided that each club-school would be allowed $5,000 a year non-taxable profit for training the pilots for the RCAF. As a result, the clubs today are in a better financial position than ever before. Since a number of the schools closed as the RCAF became larger and set up its own elementary flight training bases, some school-clubs were only in operation for three years, others for four or five years. They now have in their treasuries, therefore, a minimum of $15,000 to $25,000 to start post-war private flying operations.

While the clubs do not expect government grants, they do look forward to obtaining some of the RCAF equipment at disposal rates or less. For instance, at the peak of the RCAF and British Commonwealth Air Training Plan development, there were some 150 different training schools in the Dominion. Buildings, hangars and equipment at these schools will have to be sold or allowed to deteriorate. The flying clubs expect to obtain hangars, portable buildings which can be turned into club houses, overhaul and repair equipment, and similar materials at reasonable prices. Conferences between the RCFCA and government officials are to be held at Ottawa.

The association has not been a big organization, but rather a committee of club officials with regional representatives sitting on an executive board to handle the various club problems and the wartime training plan. So far the only expenses incurred have been a stenographer's salary and office rent at Ottawa. Dues have been $100 per club per year, irrespective of the size of the club.

(*Continued on page* 106)

Wherever the ground troops landed, whether Army or Marine, there were Navy planes to lend them close support—a pattern that improved as we advanced toward Japan.

INVASION SUPPORT-

By LAWRENCE E. WATKIN

ANY Marine or infantryman who has helped establish a beachhead can tell you that when the going was toughest, their angels of deliverance were likely to be *Wildcats, Hellcats, Corsairs, Avengers, Dauntlesses* and *Helldivers*. For the benefit of the uninformed, those are Navy planes and it was Naval support aircraft that supplied the air cover which put the troops ashore.

Infantrymen know the air support score. Lieut. Col. A. A. Vandergrift, Jr., a battalion commander on Iwo Jima, expresses the general sentiment with the statement: "I used to fight with these Naval aviators over air support, but I've no argument with them any longer. They've been superb."

Capt. William L. Bull, commanding officer of the 95th Ordnance Bomb Disposal Squad, adds that "one of the most spectacular features of the Okinawa battle was the extremely effective close support given our ground troops by the Navy air force. They dive-bombed, strafed and fired rockets into Jap positions incessantly every day the weather permitted flying. And when I say it was close support I mean it was really close."

Experience in both the Leyte and Luzon operations completely sold Gen. Walter Kruger's 6th Army on the superiority and desirability of Naval air support

Nerve centers of invasion operations were the Navy's amphibious force flagships which co-ordinated ground, sea and air forces.

T- NAVY STYLE

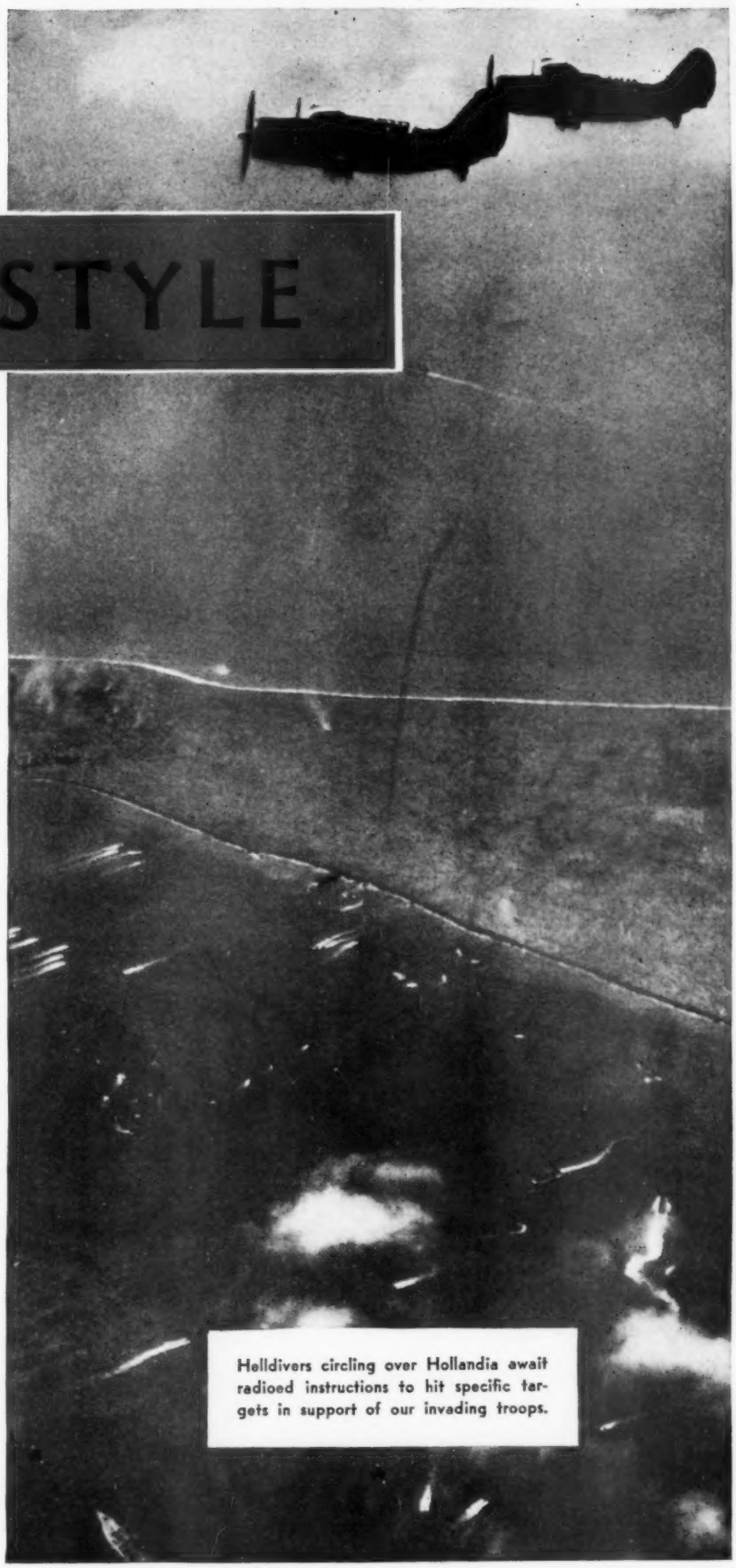
in an amphibious operation. Even when the amphibious phase of the Luzon campaign was over and the Army Air Forces had fields and enough planes in the area to take over with their conception of deep tactical support, General Kruger would have been very happy to have had those Navy planes stay too. It was not that Army flyers were inferior, but that AAF-planned missions generally required 24 hours notice, whereas the Navy "call"

Capt. (now Rear Adm.) R. F. Whitehead directed air support.

missions (because of the tightly organized and localized nature of the amphibious operations) could be supplied within 10 minutes.

Fortunately the first Marine Aircraft Wing was available for support of the Sixth and Eighth Armies during the subsequent phases of the Philippine campaign. These Marine pilots had learned in the Solomons to give air support Navy style. With the aid of Navy-trained Marine air liaison officers supplied by the wing, they constantly speeded up the advance of the ground forces and kept casualties to a minimum by destroying Jap installations ranging on U. S. troops.

Not much has been written in this war about the tactical capabilities of the airplane. When the German General Bayerlein, commander of the Panzer Lehr Division, was captured he insisted that, had we stepped up our tactical warfare last August after the breakthrough into



Helldivers circling over Hollandia await radioed instructions to hit specific targets in support of our invading troops.

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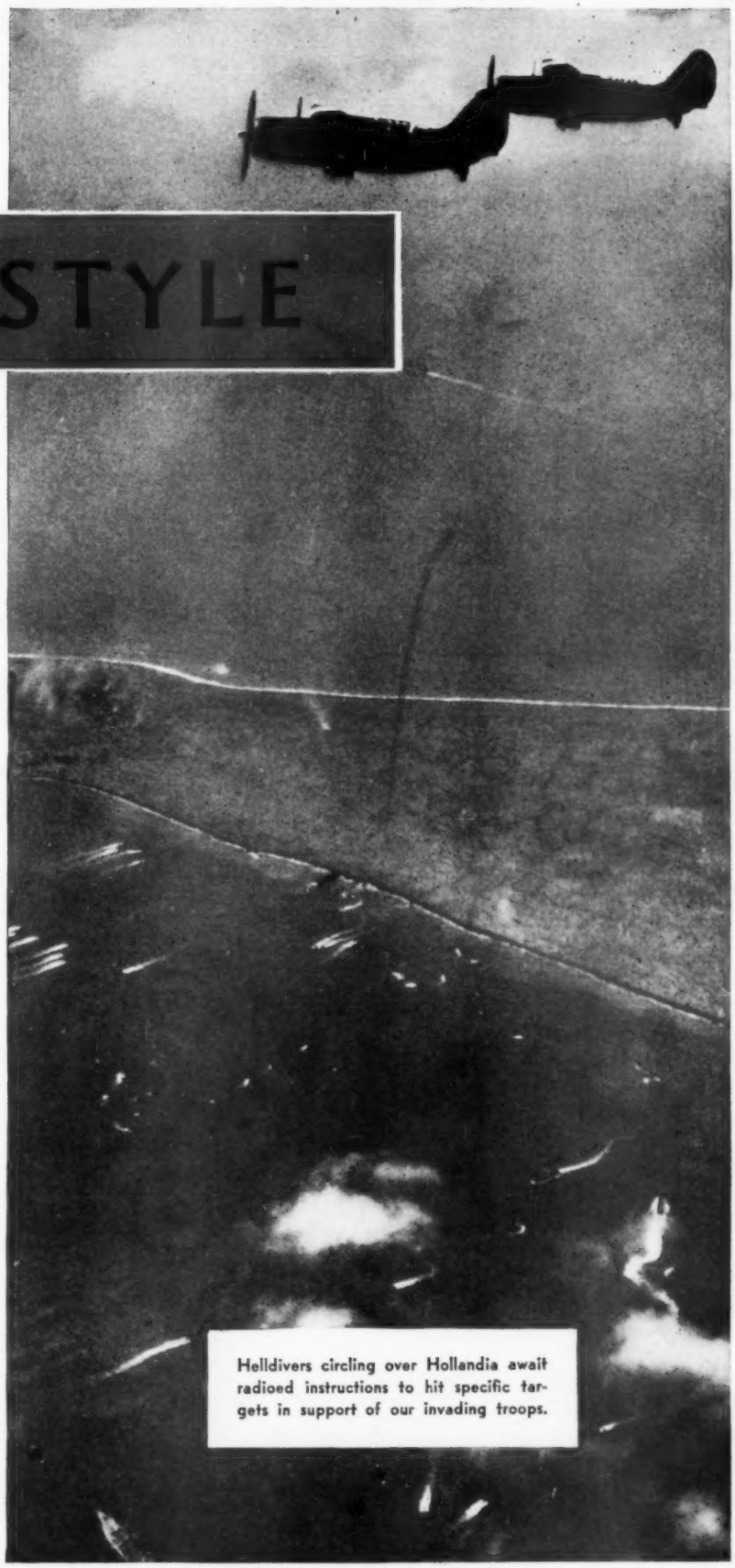


Helldivers circling over Hollandia await radioed instructions to hit specific targets in support of our invading troops.

France, we could have moved VE-Day up a couple of notches. A Washington columnist, reporting General Bayerlein's remarks after the German surrender, mused: "Wonder what the effect would be if the new Goop bomb, which spreads unquenchable fire in every direction, were dropped wholesale on Jap troops in action?" It is just as well that not many Marine and Naval aviators, dog-tired from dropping Napalm bombs on Japs, had the chance to read such comment. They had been scattering those fire bombs ever since Tinian, *a year before.*

Generally speaking, the Navy developed this advanced type of infantry support out of necessity. But so many interesting factors were involved that it might be well to give them a preliminary listing before explaining the system itself and the history of its development.

1. Navy air has always considered itself a means to an end. If the fleet's job is to get the infantryman ashore, the Navy plane will share in the task in every way possible for it. One reason the Navy is so dead set against a separate air force is that such a situation would make combined amphibious operation impossible of accomplishment. Compare the attitude of an air force insisting upon coequality in taking an objective with that of Navy airmen who, in planning their part of the amphibious landing, *were shipmen first of all.* They taught their aviators teamwork. They taught them never to drop a bomb where naval gunfire or artillery could do the job better.

2. Navy conception of command is based upon superlative communications which will enable a supreme commander to give any unit under him an instantaneous order. Hence the phenomenally quick service Navy air support can supply. Radio networks are kept clear for instant transmission of orders to airmen. Airmen are trained to keep absolute radio silence save when they must broadcast.

3. The carrier is a handy airfield, brought right to the scene of operations. And when carriers couldn't be brought close enough to satisfy the Navy's passion for speedy performance, the orbiting of planes at initial points over the battlefield and briefing their flyers by radio was instituted.

4. The Navy planes themselves are naturals for supporting troops. They are small, fast, maneuverable, heavily armored. Though designed to strike against enemy shipping, they are particularly adaptable for those tactical operations over land which call for close-up accuracy.

5. The training a Navy flyer receives enables him to strike at small elusive targets such as a submarine, a swiftly-moving destroyer, or gun emplacements. Not until he can lay a bomb on a dime, is he okay for support work.

So much for the "why." *How* does the thing work? It would take a lengthy book to describe the part of Navy air support in the orderly confusion of any D-Day. Briefly, the story goes something like this:

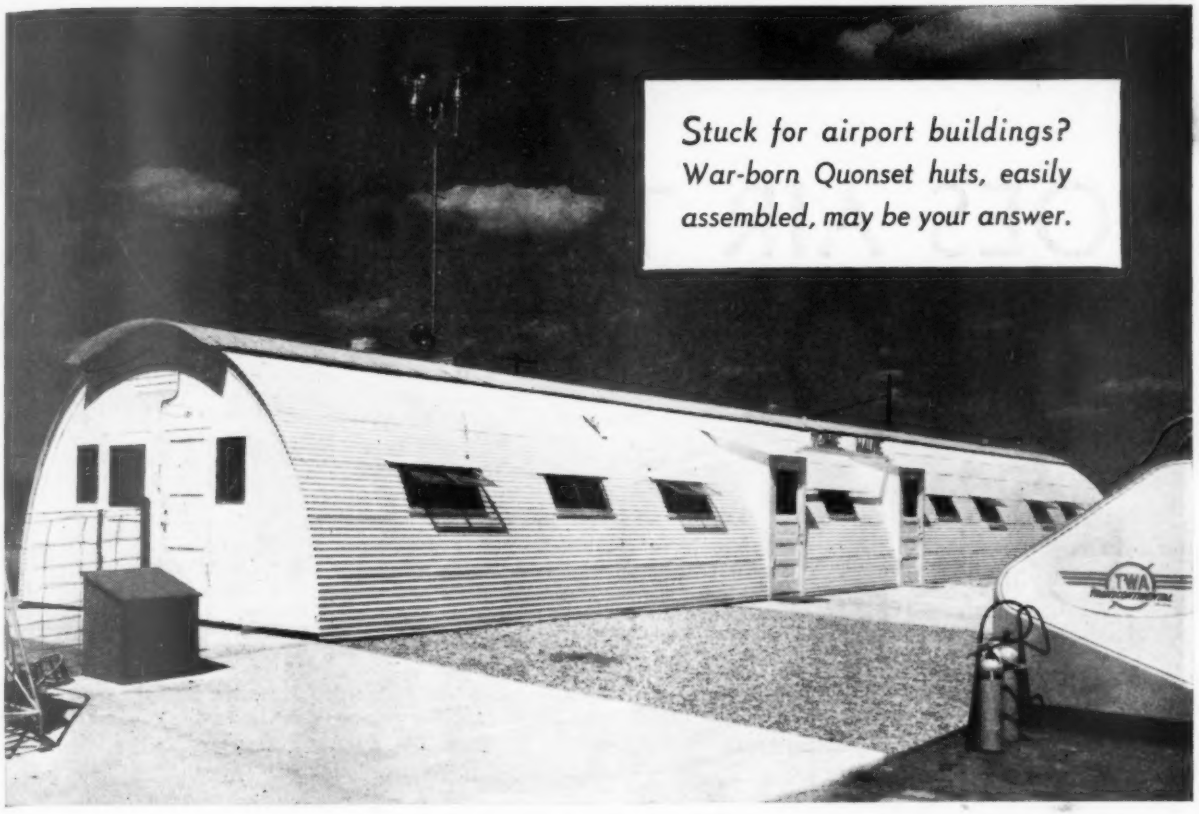
We want to take a certain island to use as a base for *Superfortresses.* For a week the big guns of the Navy have alternated with strikes from the fast carrier forces in breaching its fortifications. Shells, bombs, rockets have churned up the landing area, destroying all save the best-constructed defenses. On D-Day the LCVP landing boats, like watchfobs hanging over the fat sides of the transports, are lowered into the sea. They scoot around in assembly circles like agitated water bugs before they fan out and race toward shore. To the tremendous jar of the ship salvoes is added the swish of rockets from the LCI(G)'s. Dust bursts from the shells and the smaller but more numerous digs from the rockets are walked back farther inland as the boats approach shore. Simultaneously, planes fly over the lowered trajectories of the shells and the rockets to supersaturate the shore defenses.

Plane strikes during the landing are

(*Continued on page* 92)

Navy Hellcats hurtle down within range of Jap small arms fire to attack the Iwo Jima beach in advance of our Marine landings. U.S. task force can be seen in background.

A leatherneck of the veteran First Marine Division pauses in his advance across southern Okinawa to watch a Navy Hellcat swoop low to strafe scattered enemy positions.



Instead of going to war, two Quonset huts were joined together to make a 20 x 90-foot administration building at Terre Haute Airport.

QUONSETS FOR AIRPORTS

By CHARLES T. PEARSON

AIRPORT owners and operators, complaining that they can't obtain sufficient hangar and office space owing to high costs and labor shortages, may find a solution in the war-born Quonset hut. Standard equipment for many Naval and some Army installations both in the U. S. and overseas, the pre-fabricated metal buildings were used for everything from mess halls to warehouses. They're all sizes and all prices.

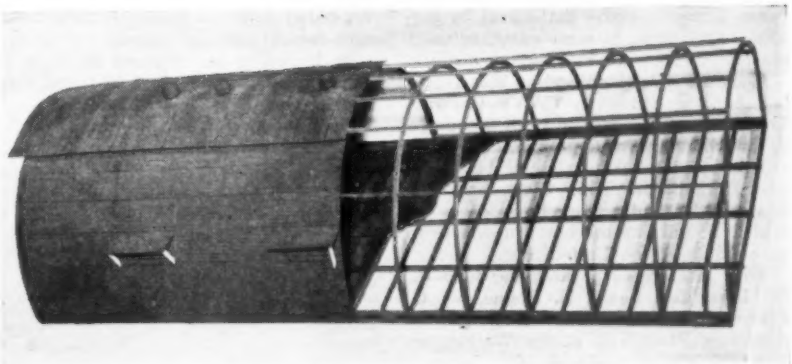
Already the Hulman Airport, Terre Haute, Ind., has turned some of these war babies into peacetime activity. With funds donated by Antone Hulman, a local manufacturer, two of the all-metal, arch rib buildings were purchased and joined together to make a 20x90-foot administration building.

The interior of the building, insulated for temperature control and air conditioning, resembles an airliner with two-tone green walls and a light cream ceiling. Waiting room chairs are airliner seats.

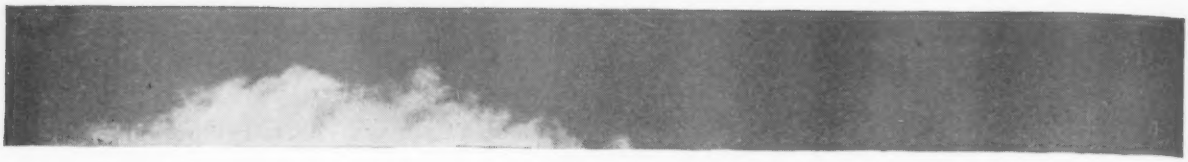
Waiting room and ticket office occupy a central 26-foot section of the building, with luggage rooms off the office. The west end houses a communications and operations room measuring 10x23-feet; mechanics' shop, 10x15-feet; and the manager's office, 10x13-feet. At the east end, adjoining the waiting room, are rest rooms, boiler room and a space 20-feet square reserved for the CAA.

This pair of Quonset huts joined to-

(*Continued on page* 100)



Here's the principle of Quonset hut construction. Arch beams are attached to ends of floor sections and covered by nailing metal or other material to grooves in beams.



DOES AIR TRAVEL PAY?

Using five-place Beechcraft like this, the CAA's Contract Termination Board travelled 126 days, saved $3,626.72 over rail costs.

A plane in your business? Executive plane travel can be faster, cheaper and more convenient. Here are costs on a 126-day trip to 63 different cities.

By CHARLES WILSON

FOUR CAA officials with a difficult administration job on their hands have the figures to prove that travel by personal airplane is, in some cases, actually cheaper than on the railroads or airlines.

Assigned to a job of settling War Training Service contracts, CAA's Contract Termination Board found itself tied down too much at its Washington desks and decided that its business could better be conducted in the field. Sixty-three different cities had to be visited on a job which would take the board members to all sections of the United States.

With brief cases packed, the four—L. W. Lawrence, Lewis N. Bayne, W. G. Stewart and John Mifflin—climbed into a five-place Beechcraft at the Washington National Airport and took off.

One hundred twenty-six days later they were back in Washington with the job completed. Stewart, CAA property management officer, began to wonder how their cost of flying around the country compared with rail transportation. Using time-tables and cost sheets, he figured that by using an airplane $4,513.19 in actual money and 38 days in travel time was saved.

His figures work out like this:

	Air Travel	Rail Travel	Savings
Calendar days	126	169	43
Itinerary days	108	146	38
Actual travel time	102 hrs., 51 min.	609 hrs., 22 min.	506 hrs., 31 min.
Total transportation costs (four persons)	$2,312.33	$3,198.80	$866.47
Man days consumed on itinerary	432	584	152

Stewart figured that the Government was $3,626.72 better off in salaries and expenses saved. He based his figures on $17.86 as the average daily salary of the four men and added the $6 per diem allowed men traveling on business.

Impressed by all these figures, the CAA ordered the entire report of the trip published in a pamphlet ponderously titled "Analysis of the Savings Affected Through the Use of Government Airplane for Transportation by the Contract Termination Board of the Civil Aeronautics Administration, Dept. of Commerce, Washington, D. C." Through the figures in this book, the CAA strongly supports the use of airplanes for business activities and contends that the use of the aircraft in many business trips will actually be a money saver.

The CAA points out, however, that the kind of trip on which its report is based was weighted in favor of the use of aircraft and also that it was made at a time of year when weather was decidedly in

favor of the pilot. Only twice in the entire period was the airplane grounded because of adverse weather conditions.

The trip was made in four legs to various sections of the United States. In each instance, the men returned to Washington at the completion of a leg for conferences and other duties before leaving on the next journey.

Illustrating the savings made through use of the airplane, the second leg called for stops at Seattle, Santa Monica and Ft. Worth for hearings and other stops at Chicago, Fargo, Miles City, Missoula, Spokane, Sunnyside, Yakima, Prineville, Reno, Lovelock, Carson City, Minden, Bakersfield, Phoenix, El Paso, Wichita Falls, Ponca City, Tulsa, Little Rock, Nashville and then returning to the Washington starting place. By air this leg required 49 days where rail transportation would have taken 70 days.

Stewart's figures not only calculated the actual cost of gasoline and oil for the trip but allowed depreciation of four months on the airplane (based on a five year life and original cost of $20,000) and an allowance against the cost of the next overhaul. Rail transportation would have cost $3,198.80 for the four men, but the cost of using the airplane was $645.67 for actual operations plus $1,333.33 depreciation and $333.33 for overhaul. The total cost for flying the CAA plane thus was $2,312.33.

The above calculation was limited to savings in actual transportation cost. To it the additional salary-expense savings of $3,626.72 for the Government employees is a healthy item. This figure is perhaps low when compared with the salaries and expenses which might be paid private business executives who would be transported by air.

Not included in the CAA report was the cost of taxi or other transportation to airports where inspections took place.

Stewart based all railroad scheduling on the assumption that reservations could be obtained precisely when needed and therefore represented an ideal travel condition not yet possible.

On the unfavorable side of the argument for the use of aircraft for business transportation, CAA pointed out that in many business trips there may be an extra outlay for the salary of a pilot. A pilot, paid as low as $10 a day, would have brought the transportation costs about $200 higher than rail. On this trip, however, a CAA man was flying the plane. Weather during some seasons of the year might cause delay and increase salary costs.

Cost of lightplane transportation remains fixed whether two or four persons are traveling and rail costs are estimated on the basis of one passenger. In this case, if there had been but two board members, the rail cost would have been halved. However, as the Beechcraft used was a five-place airplane, a fifth man could have been carried and the costs per man would have decreased proportionately. CAA points out that there are a wide variety of two and three-place planes on the market which could be used if only two or three persons were to be carried.

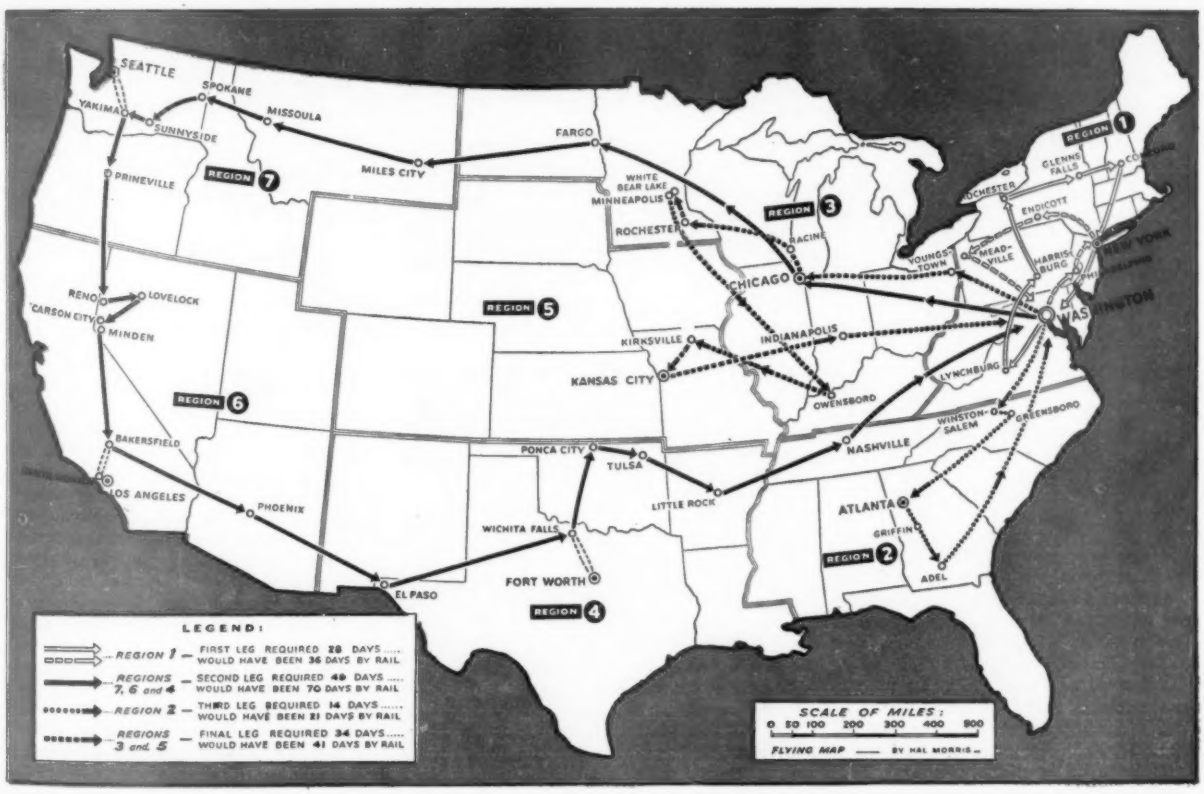
On the positive side of the airplane versus rail transportation discussion, CAA says:

Pilot cost can be ruled out in many private businesses for trained flyers from the military services are returning to industry in positions where they can double as both pilot and businessman. In addition, CAA envisions the time when airplanes will be simplified to the point where the average man can operate them in connection with his work much as he does an automobile.

Travel is simple when the railroads take the businessman to locations where easy connections are possible, but when destinations are off the main line route, surface travel becomes time-consuming and costly. In addition, natural barriers often slow up rail transportation where they offer little opposition to an airplane. In the CAA board's jaunt the trip from Prineville, Ore., to Reno, Nev., is about 58 hours by rail and only 2½ hours by airplane.

The CAA report sums up its findings with these words:

"We feel that the use of privately-owned aircraft by . . . any Government agency or by any industry can be advantageous under certain circumstances; each trip to be made, of course, will have to be considered on the basis of the purpose of the trip, length, and the type of business to be conducted." END



Board's trip was made in four legs covering the seven CAA regions. Time required was 126 days, compared with estimated 169 by rail. Box at left shows the time saved on each leg. To travel cost savings must be added value of men's time for 43 days saved.

MASS-PRODUCING THE *Merlin*

Workers attach supercharger to Merlin. American precision methods make assembly line techniques possible—every part must fit.

By PAUL H. BECKER

Automobile engineers took a British hand-built engine and, using U. S. assembly-line techniques, constructed it faster and cheaper.

IT TOOK the war to prove that the aircraft engine is not that complicated micro-micro-inch construction problem peacetime talk has made it. It is larger, lighter-per-horsepower and has more parts than the automobile engine. But it can be made with the same ease, relatively cheaply, and on a similar assembly line.

The Packard Motor Car Company was the first automobile manufacturer to prove this. In two years Packard made on its assembly line as many engines as British manufacturers could make in eight years. The engine, of course, was the Rolls-Royce *Merlin*.

Modified to fit U. S. requirements, the *Merlin* plans were turned over to the Packard Company in September, 1940, with an initial order for 9,000 units—3,000 for the British, the balance for the AAF.

Although no figures are available, it was estimated that by British methods, a *Merlin* engine was costing perhaps $25,000 crated for shipment. What Packard charged for their first engines is not known, but at the end of the war the automobile company was manufacturing a *Merlin* far more complex than the original product for about $12,000.

The secret of this low-cost, high production manufacturing is the assembly line. Rolls-Royce manufactures a "fitter's" engine with parts being brought to the unit under construction on a bench. If the part doesn't fit, it is machined until it does meet required specifications.

An American assembly line reverses this procedure. A conveyor belt brings the engine to the parts which always fit, for by American methods all parts are made so precisely that they are always interchangeable.

Packard entered the *Merlin* contract amid much headshaking by those who believed that production of aircraft engines was an undertaking for specialized companies. Packard's engineers, however, concluded that the fundamental problems in the design, development and production of automobile and aircraft engines were pretty similar.

The operating parts of the *Merlin* were found to be no more accurate than corresponding automobile engine parts.

A "U" line was designed by Packard engineers for disassembly, inspection and reassembly following Merlin's initial test run. Successive parts taken off engine were passed across to meet same engine block at proper reassembly stations on other side of "U."

Where the automobile engine designer was highly cost-conscious, the aircraft engine designer was extremely weight-conscious. But the accuracy achieved painstakingly by the latter had been accomplished by the former as a natural result of the automobile industry's insistence upon complete interchangeability and on avoidance of all expensive selective fitting practices.

Packard's engineers were not too familiar with the reactions of some of the highly-stressed materials used in aircraft engines. But, after experimentation, they agreed that, with few exceptions, the methods of producing mechanical fits would be the same for the *Merlin* as those with which they had become familiar in the manufacture of automobile engines.

Since the British use the third angle projection, it was necessary to re-draw every one of the 2,500 Rolls-Royce "left-handed" prints and to substitute American nomenclature or run the risk of producing an engine that would run in the wrong direction. Some 75 men were busy for four months making 125,000 blueprints covering 720,000 square feet of paper.

As soon as the first drawings were approved, they were released to the production men and work began on the manufacture of jigs, fixtures and machine tools. Contrary to popular belief, very few of the machine tools used to build automobiles were convertible for use on aircraft engine work.

Production experts found that the *Merlin* had 1,978 different part numbers—exclusive of the carburetor, boost control, magneto and ignition harness which were all purchased from outside firms as complete subassemblies. Three thousand five hundred seventy-five machine tools

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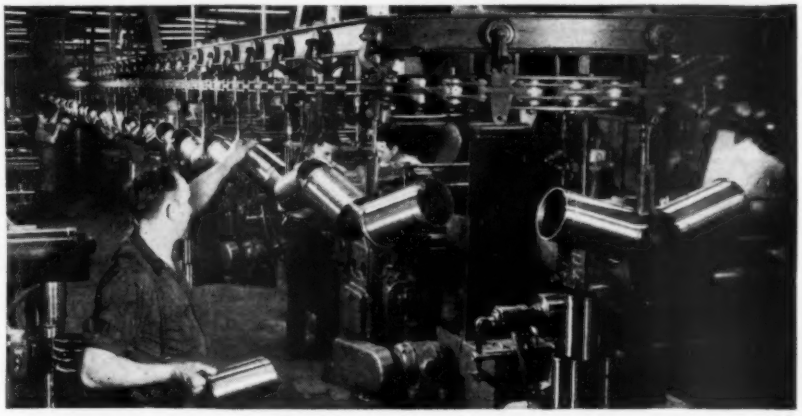
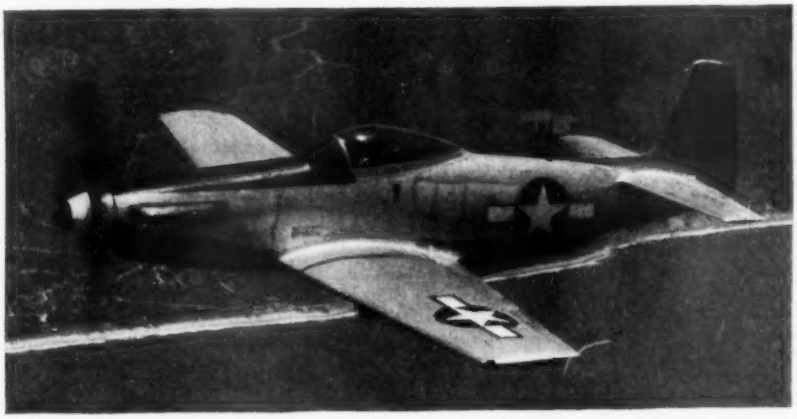


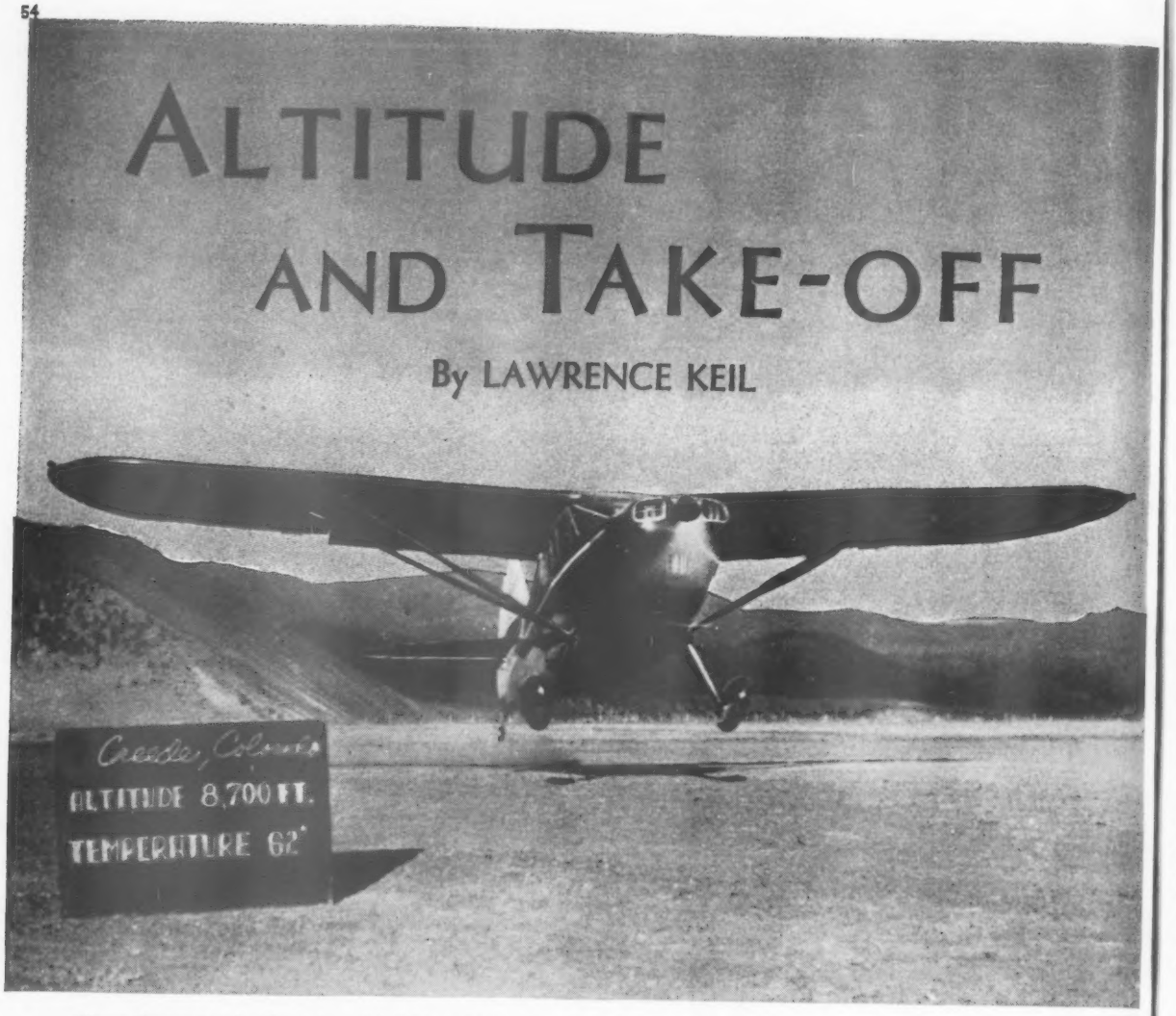
Even sub-assemblies were finished on assembly lines. Here several hundred feet of cylinder liners travel on overhead conveyor line to various machining departments.



Using British-designed Merlin engine as manufactured by U. S. methods, North American Mustang set cross-country records. British took most of Packard-built Merlins.

ALTITUDE AND TAKE-OFF

By LAWRENCE KEIL



Stinson Voyager's take-off run from this field would be three times longer than from sea level airport with same temperature.

Temperature and pressure changes at various altitudes affect your airplane's performance. Here's how and why—and a table worth keeping.

WITH lightplanes and their pilots confined to the vicinity of home airports, little concern has been expressed regarding the behavior of these planes in other geographical regions. But with most wartime restrictions on private flying abandoned, and with the aviation industry avowedly prepared to meet consumer demands for private planes, pilots should acquaint themselves with the effect of various altitude and temperature changes upon their plane's standard performance.

Actual flight tests at altitudes from sea level up to and including 7,000 feet, and at temperatures ranging from zero to 100°, were recently conducted by the Flight Engineering and Factory Inspection Division of the CAA. From the data obtained, simplified tables were compiled which enable a pilot to determine performance characteristics of his airplane at a given altitude and specific temperature. For lack of space only the values of greatest importance will be discussed here—the take-off run, the rate of climb for the first minute and the stalling speed.

In order that the accompanying chart may be fully understood and applied to a particular airplane, it is essential that lift, airspeed and altitude are also understood. Prerequisite to such understanding is a knowledge of the relationship of "standard atmosphere" to an altimeter.

Atmospheric pressure and temperature at sea level vary from time to time at any given point of reading, as well as from point to point at any specific time. At almost any station in the United States, the atmospheric pressure may fluctuate over a range of 70 or more pounds per square foot, and the temperature 100° or more during the period of a year. Although the temperature reduction is normally considered to be 3.5° per 1,000 feet of altitude increase, it may drop from only one or two degress to as much as five or six degrees per 1,000 feet. It is almost an impossibility to predict the pressure and temperature at a given point more than a few hours in advance.

To provide values universally adaptable, fixed figures were adopted and termed "standard atmosphere." They are based on the following assumptions:

1. Atmospheric pressure at sea level is invariably 2,118 pounds per square foot:

or 14.7 pounds per square inch—or 29.92 inches of mercury.

2. Temperature at sea level is invariably 59°.

3. Temperature invariably decreases uniformly from 59° at sea level to —67° at 35,300 feet, or a temperature decrease of 3.566° per 1,000 feet. For all normal average purposes, the figure of 3.5° is generally used. Above 35,300 feet, there is assumed to be no temperature lapse.

Establishing our distance above the earth when in an airplane is usually done by the barometric altimeter, which does not actually measure altitude. It measures pressure, with dial readings in terms of feet. However, this reading is based on *standard atmosphere*, and therefore may or may not give the actual altitude of the plane. Accuracy of the reading depends upon how closely the pressure and temperature at the point of altimeter reading approximate standard atmosphere conditions (29.92 inches of mercury and 59°).

For example, if on a hot day the temperature is 110° from sea level to an altitude of 5,000 feet, and it is assumed that the pressure at sea level is standard (29.92 inches of mercury), one may actually be at 5,000 feet, though his altimeter will read only 4,500 feet. This error is caused by the less dense air (less pressure) at 110° than at standard temperature of 59°, for which the altimeter was originally calibrated.

It is likewise possible that a barometer which at sea level indicates 30.42 inches of mercury instead of the standard 29.92, may at 5,000 feet give an altimeter reading of only 4,000 feet. This clearly indicates that an altimeter reading is only an *approximation* of altitude. It is possible for the altimeter to be in error by as much as 1,000 feet.

All this accounts for the presence of an adjustment knob on most altimeters so that if the pressure of a station directly below the aircraft is known, this pressure may be set on the altimeter and the dial will change to register the correct altitude.

The airspeed indicator is somewhat akin to the altimeter in that it operates on a pressure basis. Air pressure against the pitot head opening operates the mechanism that moves the needle on a dial indicating speed in m.p.h. corresponding to that pressure. It actually is a flow meter, registering the rate at which air flows over the foil. If a plane were tethered and pointed directly into a 50-m.p.h. wind, the airspeed indicator would indicate the speed at which the air passed over the foil and exerted pressure on the pitot opening.

The dial reading of the airspeed meter is termed *indicated air speed*—an indication of the rate of airflow over the foils. *True air speed* takes into account the difference between the indicated air speed and whatever conditions (other than

(*Continued on page* 96)

TAKE-OFF DISTANCE, RATE OF CLIMB, AND STALLING SPEED

(CALCULATIONS SHOWN HERE APPLY TO SEA LEVEL ENGINES AND FIXED PITCH PROPELLERS)

Take-off run, rate of climb and stall speed can be determined easily from table at right. Simply follow down columns for proper wing and power loadings to figures opposite the correct altitude and temperature readings.

Altimeter Reading	Wing Loading		TAKE-OFF GROUND RUN ($V_{T.O.}$ = 1.1 V_S)								RATE OF CLIMB AT 1.5 V_S										STALLING SPEED		
	Power Loading		5				10				15				5				10				15			
	Temperature		15	20	25	30	10	15	20	25	5	10	15	20	15	20	25	30	10	15	20	25	5	10	15	
Sea Level	0		173	246	330	429	296	466	719	1,000	234	518	872	1,321	1,245	838	593	430	1,925	1,106	703	456	4,265	1,825	1,013	607	36.9	50.6	60.5
	20		189	270	366	476	322	530	787	1,110	254	566	957	1,470	1,203	810	564	405	1,862	1,064	668	427	4,160	1,765	966	570	37.6	51.6	61.6
	40		227	298	405	530	384	591	967	1,350	277	620	1,058	1,625	1,165	775	538	384	1,805	1,022	635	398	4,055	1,706	923	534	38.4	52.7	63.0
	60		252	352	445	580	419	701	1,062	1,540	301	717	1,160	1,808	1,128	745	513	360	1,750	981	600	369	3,950	1,650	880	500	39.1	53.7	64.2
	80		270	382	493	658	454	768	1,170	1,710	324	802	1,400	2,215	1,090	785	538	384	1,697	941	567	341	3,850	1,594	840	466	40.0	54.9	65.6
	100		270	392	541	725	457	768	1,170	1,710	354	802	1,400	2,215	1,090	785	464	316	1,643	903	538	305	3,750	1,536	800	430	40.7	55.9	66.8
1,000	0		193	276	374	489	327	540	804	1,141	256	570	967	1,487	1,183	791	553	396	1,830	1,043	652	414	4,090	1,734	945	554	37.6	51.5	61.6
	20		211	304	413	541	360	600	899	1,279	282	633	1,079	1,661	1,143	762	526	372	1,773	1,002	617	385	3,990	1,673	902	518	38.4	52.6	63.0
	40		233	342	459	605	391	656	996	1,426	306	690	1,187	1,853	1,104	728	500	355	1,717	960	585	369	3,890	1,616	860	483	39.2	53.7	64.2
	60		252	376	504	664	422	708	1,072	1,595	331	744	1,312	2,065	1,067	698	475	327	1,662	920	551	328	3,790	1,560	818	448	40.0	54.7	65.5
	80		276	401	534	704	448	752	1,138	1,695	351	791	1,393	2,192	1,030	669	450	304	1,611	881	518	300	3,690	1,505	777	415	40.7	55.8	66.7
	100		299	439	610	821	506	863	1,332	2,329	391	863	1,579	2,550	994	640	425	283	1,558	842	488	273	3,590	1,450	737	380	41.5	56.8	68.0
2,000	0		212	304	415	545	370	600	898	1,290	282	631	1,080	1,670	1,122	743	514	362	1,740	981	602	373	3,920	1,640	881	502	38.2	52.5	62.6
	20		232	335	460	606	393	660	990	1,440	305	690	1,190	1,860	1,083	714	487	338	1,683	940	567	344	3,820	1,582	838	467	39.0	53.6	64.0
	40		252	370	510	677	430	725	1,111	1,662	333	755	1,310	2,080	1,045	682	461	316	1,628	900	535	313	3,720	1,525	796	431	39.8	54.7	65.2
	60		278	407	563	745	472	802	1,231	1,820	363	830	1,455	2,330	1,008	652	437	293	1,575	859	502	287	3,620	1,470	754	397	40.6	55.9	66.6
	80		299	439	610	821	506	863	1,332	2,329	391	863	1,579	2,550	973	624	413	272	1,525	820	470	259	3,525	1,418	714	364	41.4	57.0	68.0
	100		330	467	664	930	556	956	1,492	2,562	426	990	1,760	2,890	936	596	388	250	1,474	782	440	233	3,430	1,363	673	330	42.2	58.0	69.1
3,000	0		234	340	465	615	396	666	1,010	1,460	309	700	1,210	1,900	1,060	695	474	328	1,650	918	582	331	3,745	1,548	816	450	38.9	53.3	63.8
	20		258	378	520	695	432	742	1,140	1,660	339	771	1,350	2,150	1,023	666	448	304	1,594	876	517	301	3,650	1,490	773	415	39.7	54.4	65.2
	40		285	414	575	771	481	820	1,260	1,865	369	847	1,490	2,380	987	636	422	282	1,540	837	485	272	3,550	1,434	731	380	40.6	55.6	66.5
	60		310	451	635	860	523	896	1,390	2,080	400	926	1,640	2,675	950	606	400	259	1,488	798	453	245	3,455	1,380	691	346	41.4	56.7	67.8
	80		338	494	699	945	574	990	1,538	2,340	435	1,010	1,808	2,982	918	578	375	239	1,439	759	421	218	3,360	1,329	650	313	42.2	57.8	69.1
	100		368	544	772	1,063	615	1,071	1,695	2,620	470	1,100	1,990	3,320	880	550	350	217	1,390	723	392	193	3,270	1,278	611	280	43.0	58.8	70.4
4,000	0		266	390	538	722	451	765	1,180	1,739	349	765	1,400	2,245	1,000	647	435	293	1,558	854	500	298	3,570	1,456	751	397	39.7	54.5	65.1
	20		294	431	599	799	497	849	1,320	1,965	382	860	1,560	2,535	963	618	408	270	1,504	813	466	258	3,475	1,400	707	363	40.6	55.7	66.5
	40		322	477	666	890	545	939	1,471	2,225	417	968	1,730	2,860	927	588	383	248	1,450	774	434	230	3,380	1,343	667	328	41.4	56.9	68.0
	60		351	521	735	1,010	591	1,027	1,623	2,490	452	1,020	1,902	3,180	892	560	360	226	1,400	735	404	203	3,290	1,292	626	294	42.2	57.9	69.2
	80		375	555	815	1,140	647	1,135	1,810	2,925	492	1,160	2,120	3,600	857	532	338	205	1,352	700	372	176	3,195	1,241	587	261	43.0	59.1	70.5
	100		419	630	903	1,268	706	1,250	2,020	3,210	532	1,262	2,340	4,040	822	504	313	184	1,304	660	343	151	3,105	1,190	549	230	43.8	60.1	71.9
5,000	0		293	430	601	811	495	848	1,320	1,980	380	876	1,550	2,520	938	600	395	258	1,466	790	449	247	3,400	1,364	686	345	40.4	55.5	66.2
	20		324	477	670	915	546	943	1,460	2,250	417	932	1,735	2,860	902	570	370	236	1,414	750	416	216	3,305	1,306	643	310	41.3	56.7	67.6
	40		354	525	747	1,022	598	1,040	1,646	2,558	454	1,060	1,997	3,200	867	542	345	214	1,362	711	385	189	3,210	1,253	603	277	42.2	57.9	69.1
	60		387	581	834	1,151	650	1,141	1,843	2,920	491	1,160	2,110	3,605	833	514	322	193	1,313	673	354	162	3,125	1,202	562	243	43.0	59.0	70.5
	80		421	639	920	1,283	710	1,252	2,090	3,290	536	1,270	2,350	4,090	800	486	300	172	1,266	638	323	136	3,030	1,153	523	210	43.8	60.1	71.6
	100		456	694	1,010	1,420	768	1,363	2,260	3,682	576	1,380	2,565	4,550	764	460	275	151	1,220	602	293	110	2,945	1,105	485	178	44.6	61.3	73.1
6,000	0		326	484	681	930	550	950	1,502	2,280	421	983	1,833	2,820	876	552	355	224	1,375	726	400	204	3,230	1,272	620	293	41.1	56.5	67.5
	20		359	539	758	1,048	600	1,052	1,682	2,590	458	1,073	1,953	3,310	842	523	330	202	1,324	686	367	174	3,130	1,215	578	259	42.0	57.7	69.0
	40		397	595	850	1,183	647	1,173	1,900	2,990	502	1,189	2,184	3,760	807	495	306	180	1,273	648	335	147	3,040	1,162	538	224	42.9	59.0	70.4
	60		431	655	944	1,327	727	1,286	2,100	3,400	546	1,308	2,390	4,250	773	467	283	158	1,226	611	305	121	2,955	1,113	500	192	43.7	60.0	71.8
	80		471	722	1,046	1,500	787	1,415	2,360	3,860	590	1,420	2,675	4,790	743	440	262	139	1,180	576	274	95	2,870	1,066	460	160	44.5	61.2	73.1
	100		513	789	1,122	1,680	859	1,542	2,620	4,430	641	1,559	2,982	5,450	707	414	238	118	1,135	541	245	70	2,785	1,020	423	128	45.4	62.4	74.5

By Maj. OLIVER STEWART

British Authority, Editor of Aeronautics

ON JANUARY 1 the ban on private flying in Britain was lifted. A sorry contrast was presented between the ponderous administrative preparations for the day of freedom and the lack of suitable personal aircraft and practical facilities available.

When the Air Ministry announced that the "Air Navigation (restriction in time of war) Orders 1939 and 1940" were being revoked, it also promised a "system of fuel rationing for civil flying."

That was the first drawback. Motorists had learned that paying a tax of $120 a year to be allowed to own a medium powered automobile, together with a tax of 14 cents a gallon on fuel, was not economic when gasoline rationing kept the yearly mileage low. In motoring in Britain now, the overheads are crushing. And they are also crushing in private flying. For the time being, officials and those whose businesses are ready to buy and to maintain their aircraft will be the only "private owners."

Personal Aircraft

Only two manufacturers have announced new personal aircraft, the Chrislea Aircraft Company and Portsmouth Aviation Limited. The Chrislea is called the *Ace* and first deliveries are expected in March. Tricycle undercarriage, 100-h.p. *Monaco* engine, all-up weight 1,650 pounds, wing span 36 feet, length 20 ft. 2 in., top speed 127 m.p.h. are some of the particulars.

The *Ace* is to have a simplified control system with the rudder bar eliminated. Within 10 per cent, the price is quoted at $1,900 at the factory. The Portsmouth Aviation Company's plans for personal aircraft are less clearly defined. Three models are promised, all twin-engined, twin-tail boom and powered by the *Cirrus* (Blackburn) air-cooled, in-line units.

For the rest a brake has been put on war disposal aircraft like *Magisters* and *Tiger Moths* because of the risk that spares will be scarce.

New Civil Flying Boat

Lord Winster, the minister of civil aviation, leaned out of the front cockpit of a Short flying boat at Rochester and broke a bottle of champagne on the nose, naming it the *Sandringham*.

Derived from the *Sunderland*, it carries a crew of seven and takes up to 24 passengers. By night it can carry as many as 16 sleepers. The engines are four Bristol *Pegasus* aircooled radials.

Although present trends are necessarily in the direction of simplicity, the *Sandringham* does provide a degree of luxury. It makes good use of the extra floor space which a flying boat hull can sometimes give. Wing span is 112 feet and all-up weight 56,000 pounds.

Important Appointment

Chief executive of the Society of British Aircraft Constructors is an appointment carrying heavy responsibility, for the Society sets the pace in most dealings with Government departments. Edward C. Bowyer, who joined the Society in 1930, has now been appointed to this post and made a director. He succeeds Sir Charles Bruce-Gardner, formerly one of the governors of the Bank of England.

The SBAC was founded in 1916 and its affairs are controlled by a council. President this year is Arthur Gouge; Major Kilner is deputy president.

Chute Suits

That popular American, who has lived most of his business life in Britain and has built up a large parachute business there, Leslie Irvin, told your correspondent that he believes that civil aircraft ought to carry parachutes for passengers and crew.

He admitted the difficulties of getting out of an air transport quickly but said they could be overcome if the need for emergency evacuation provision were taken into account in the original design. He believes that the eventual solution would be one already tried but discarded —the detachable cabin.

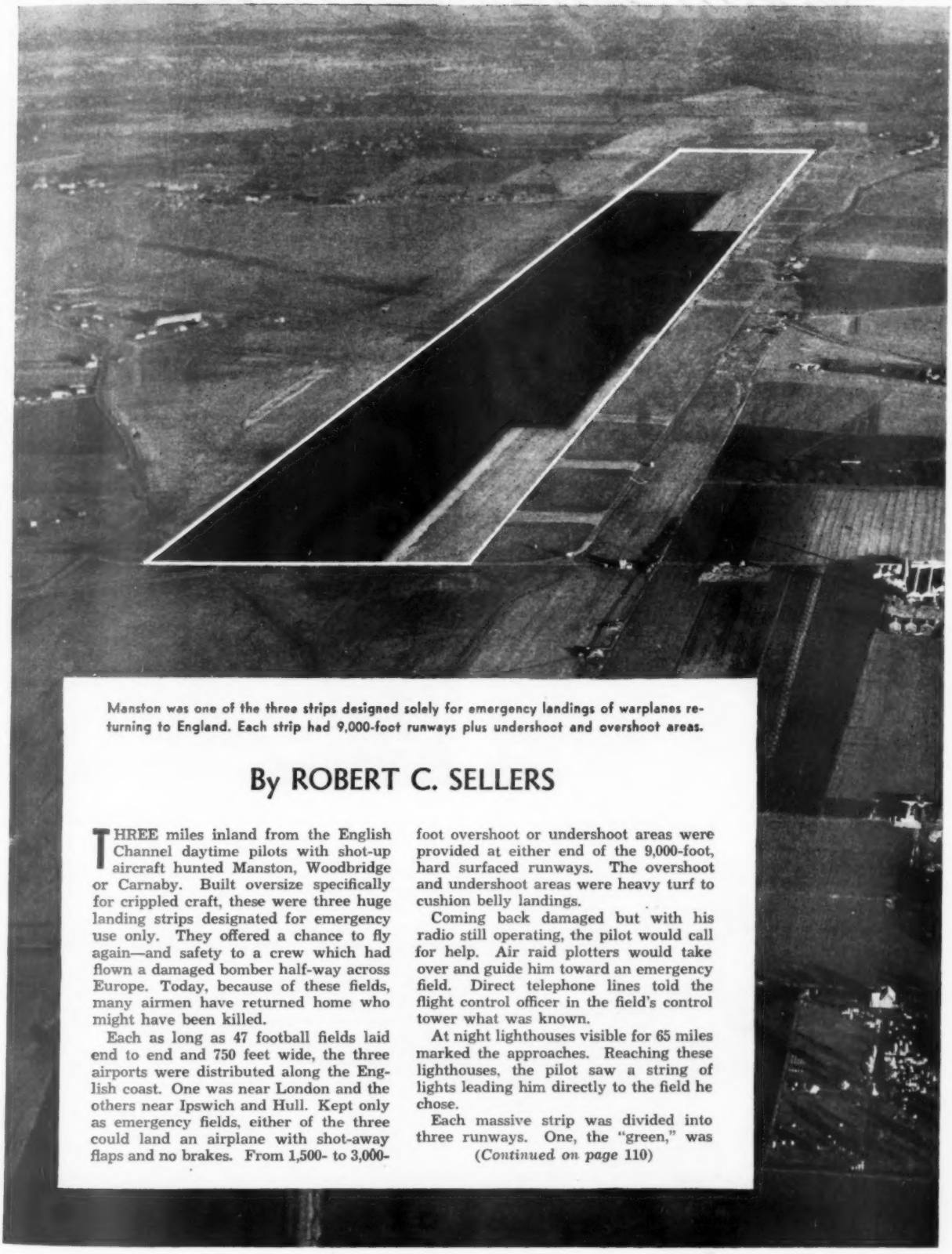
The aircraft captain would be able, in an emergency, to jettison the entire cabin with all the passengers inside it, including the old ladies. The detached cabin would be lowered to the ground on multiple parachutes like those used for air-sea rescue lifeboats.

Irvin (his company, the Irving Air Chute Company of Great Britain, owes the "g" on the end of its name to a stenographer's slip when the articles of as-

(*Continued on page* 114)

Developed from Short Sunderland of RAF's Coastal Command, the Sandringham is England's newest passenger flying boat. With a range of over 2,780 miles and maximum weight of 56,000 pounds, it carries 24 passengers, cruises at 190 m.p.h.

WARTIME CRASH STRIPS



Manston was one of the three strips designed solely for emergency landings of warplanes returning to England. Each strip had 9,000-foot runways plus undershoot and overshoot areas.

By ROBERT C. SELLERS

THREE miles inland from the English Channel daytime pilots with shot-up aircraft hunted Manston, Woodbridge or Carnaby. Built oversize specifically for crippled craft, these were three huge landing strips designated for emergency use only. They offered a chance to fly again—and safety to a crew which had flown a damaged bomber half-way across Europe. Today, because of these fields, many airmen have returned home who might have been killed.

Each as long as 47 football fields laid end to end and 750 feet wide, the three airports were distributed along the English coast. One was near London and the others near Ipswich and Hull. Kept only as emergency fields, either of the three could land an airplane with shot-away flaps and no brakes. From 1,500- to 3,000-foot overshoot or undershoot areas were provided at either end of the 9,000-foot, hard surfaced runways. The overshoot and undershoot areas were heavy turf to cushion belly landings.

Coming back damaged but with his radio still operating, the pilot would call for help. Air raid plotters would take over and guide him toward an emergency field. Direct telephone lines told the flight control officer in the field's control tower what was known.

At night lighthouses visible for 65 miles marked the approaches. Reaching these lighthouses, the pilot saw a string of lights leading him directly to the field he chose.

Each massive strip was divided into three runways. One, the "green," was

(*Continued on page* 110)

Have You Seen?

Versatile Boeing XF8B-1 Navy fighter can be used as bomber or torpedo plane, carries six 20-mm. cannon. It has contra-props.

New Navy patrol plane, Lockheed P2V has 5,000-mile range, is elaborately equipped with radar and fitted for atomic bombs.

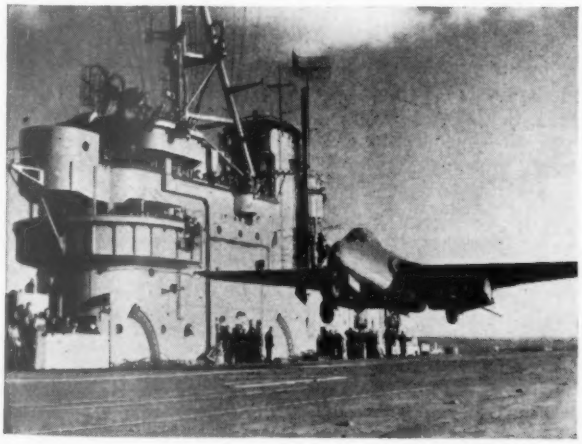
New cowling of Lockheed Constellation provides easy access to 2,500-h.p. engines, saves 15 to 20 minutes on each inspection.

Continental-powered Cessna 140 has all-metal fuselage, fabric-covered wings, flaps, steerable tail wheel, 125-m.p.h.-plus top speed.

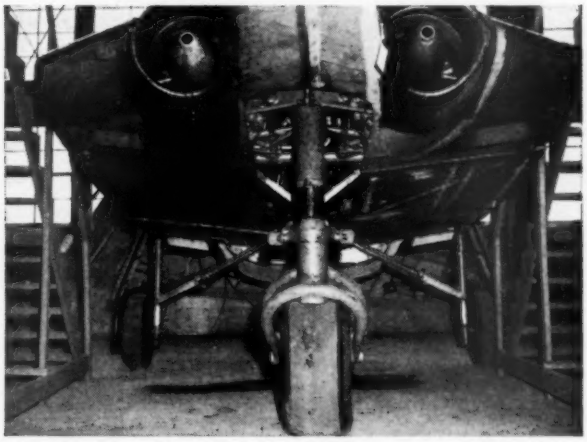
Commonwealth Skyranger is new 75-h.p. lightplane now in production. It is two-place, has wing-tip slots and has just received its ATC. Cruising speed is 103 m.p.h. and its range is quoted at 600 miles. The landing speed is 38 m.p.h. Skyranger is "practically unspinnable."

"Chaff" dispenser under Mustang wing continuously released aluminum foil strips by conveyor line system to jam enemy radar.

Fighter brakes on Black Widow slowed plane in flight, prevented it from over-running enemy aircraft in night combat operations.



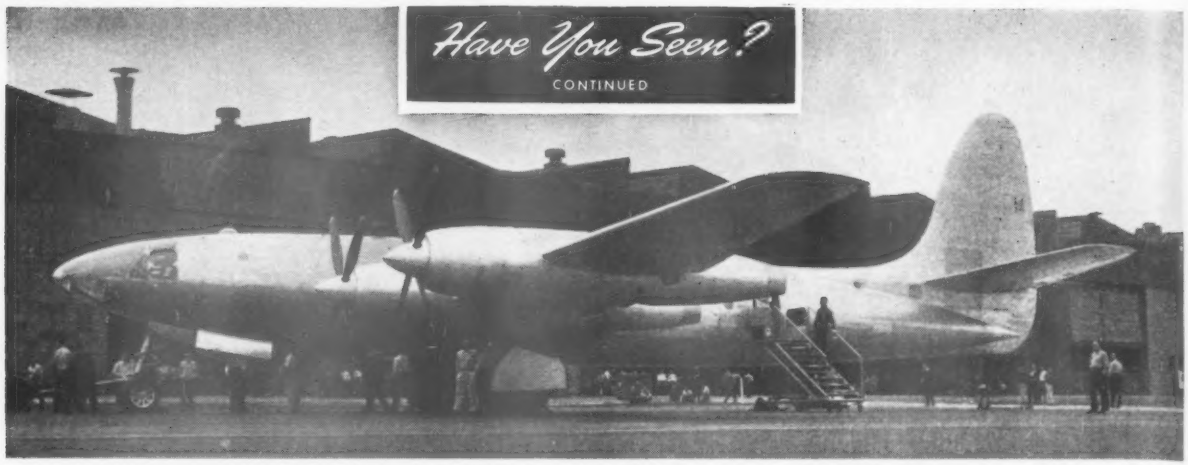
British Vampire made jet plane history when it landed (at 95 m.p.h.) and took off from British light carrier, H.M.S. Ocean.



German Horton tailless fighter had two jet engines, tricycle gear, span of 53 ft. 6 in. It had four 37-mm. cannon, speed of 720 m.p.h.

Have You Seen?

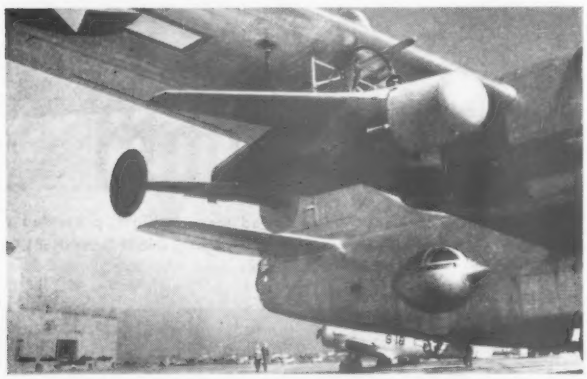
CONTINUED



Republic XF-12 is new high altitude pressurized AAF photo plane with four 28-cylinder Wasp Major engines of 3,000-h.p. each. XF-12 has span of 129 ft. 2 in., length of 92 ft. 9 in. Turbo exhausts help push cruising speed beyond an estimated 400 m.p.h.

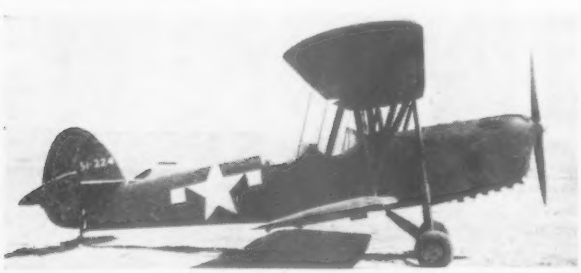
Yes, he made it! Unusual photo recently sent in shows Thunderbolt coming in for hot downwind landing during Burma operations.

Martin XPBM-5A version of Mariner is largest amphibian aircraft ever built. Modification adds 4,500 pounds to weight.

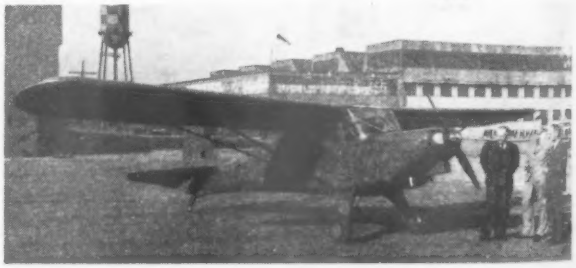


Carrying heavy explosives, Navy robot "bats" are guided to targets by radar echoes after launching from mother planes.

Another AAF experiment. Army plane sprays DDT over swamps near Ladd Field, Alaska, in attempt to end mosquito plague.



Caproni-Vizzola "Saiman" 200 was seized by AAF in Sicily and used for miscellaneous purposes. Alfa 115 engine gives 200 h.p.



Canadian post-war plane is two-place Fleet Model 80 "Canuck," with 75-h.p. Continental engine. Its cruising speed is 100 m.p.h.

Why Fly PATTERNS?

By JOHN R. HOYT

A precise pattern seems foolish to the novice but it reveals whether the plane or the pilot is boss.

Figure 1: Students must realize that heading and pattern are not the same if plane flies cross-wind.

MANY flyers and student pilots have asked the question, "what's so important about a pattern?" Veteran pilots fly along without ever giving conscious thought to their flight patterns. And who ever heard of a pilot showing a passenger what beautiful patterns he can make!

It takes planning and real headwork to make a good pattern. More students are washed out or fail on their flight test because of poor patterns than for any other particular maneuver. It is something that makes a flight examiner think, "this student can't use his head." And the minute he gets that impression, the student is riding for a failure.

Unfortunately, many students think a pattern is something one learns just to get through school, failing to realize that it is the best clue an instructor has as to just how much flying is being done by the student and how much by the airplane—another way of saying, "They aren't flying the airplane, they are being flown by it."

Actually, we fly some type of pattern every time we take a plane into the air. When we circle an airport we fly a pattern. If we did not, the wind could drift us either over the field or too far away from it. When we fly cross-country we make a pattern or track. If we did not, we would arrive somewhere other than the intended destination, or even become lost. All of which helps to prove that a good pattern really means *headwork*. That's why it is important, and why it counts in flight tests.

Why is flying a good pattern so hard for a student? Frankly, no one seems to know. One reason may be that some students are afraid to move the controls for fear they are not supposed to be doing that particular thing. Thus they don't make corrections aggressively enough to serve their purpose. Another reason is that perhaps they may not have a clear conception of what or where the pattern is, and aren't certain what they should do. There may be many more reasons but the fact remains that many students could pass an acceptable flight check if this pattern business were explained to them or presented in a manner that aroused their enthusiasm.

A student once asked, "What good does it do me to learn how to fly a pylon eight? I'll never do one again, once I've passed my flight test."

The student was both right and wrong. He was right in saying he probably wouldn't ever do a pylon eight again, because the maneuver itself is not used in conventional flights. And yet, there is the story of a Naval pilot who aided in the rescue of a downed flyer in the sea by doing a pylon eight. All he did, the rescuer said later, was to climb to pivotal altitude and do pylon eights—keeping the tip of his wing on the swimming pilot until rescue came.

Although the average private pilot may never rescue a man at sea, he would be wrong if he rashly assumed that the pylon eight was worthless on that account. Which maneuvers would you, as a flight examiner, give for a flight test? Wouldn't you give some maneuver that forced a pilot to demonstrate planning, ability to fly where, when, and how he was told, and headwork? Could you think of many maneuvers to give? What is a better criterion of a good pilot than a *pattern* maneuver?

It would seem then that there are several reasons for patterns:

1. To permit an instructor to test his student. It tells the instructor how much the student is flying the airplane and how well the student is following orders. It tells him how

(*Continued on page* 108)

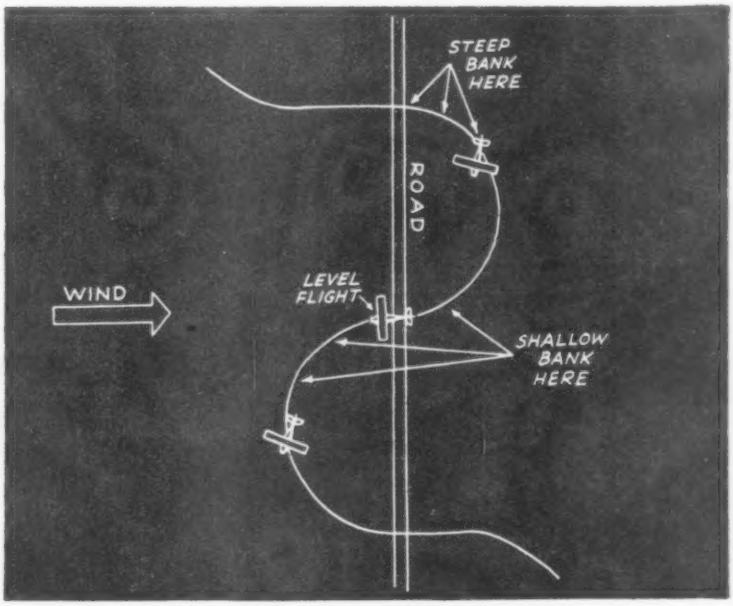


Figure 2. Plane's ground track and not its heading is vital in cross-wind S-turns. A precise ground track means that pilot is in charge and using his head constantly.

I Learned About Flying From That!—No. 76

By ROBERT S. ANIS

This downwind landing at an Ethiopian airfield wiped out the country's one-plane air force.

EVERYTHING I learned about downwind turns close to the ground came into my head—after I hit that ground. I am able to think in retrospect only because of the wonderful sturdiness of the airplane I mishandled, and to that special providence that watches over pilots.

The date was August 19, 1943, on a lovely Sunday morning in Addis Ababa, home of Hailie Selassie and seat of government for Ethiopia. This day was to be particularly memorable as the aircraft I ruined was the sole remaining bit of flyable equipment belonging to the Ethiopian government. A twin-engined *Monospar*, it was built in London and had found its way to Ethiopia via the RAF.

In company with an American civilian flight engineer, Lyle R. Ruble, I had been loaned to the Ethiopian government to aid in the development of its air transport system with American lend-lease airplanes. While awaiting these planes, I decided to fly the aged *Monospar*. Ruble and a father and son team of Italian mechanics left-over from the Italian Ethiopian campaigns, pitched in and got the fabric-covered, 1930 plane into some form of mechanical shape.

In appearance, this *Monospar* was not unlike our Cessna *Bobcat*. It was of welded tube structure, had twin engines, twin rudders and was a four-place cabin plane with a fixed gear. The pilot's wheel was of the "Y" type and by pulling a pin you could swing it over to the co-pilot side of the ship. Powered by two Bristol-built Niagara *Pobjoy* engines, it developed a total of 200 h.p. at take-off. The engines were built in a single seven-cylinder bank and wound up to 3,300 r.p.m. You could wrap your arms around the circumference of one of them, they were that tiny.

Because America and Italy were still at war at the time, I told the Italian mechs that they were going to make the first hop with me. This, I thought, would prevent sabotage. I didn't know then that my own foolishness would "sabotage" all our efforts.

It was a proud group of two Americans, two Italians and an assorted group of Ethiopian natives who listened and smiled broadly as the engines broke into something approaching a roar. All instruments checked out okay and I signaled the Italian boy, Mario, to get aboard. He settled himself in the co-pilot's seat and showed no signs of fear, a feeling that definitely was not mutual.

The runway at Addis Ababa is 1,600 yards long and about 75 yards wide but with a drawback. The center of the field is 7,726 feet above sea level. Hills and mountains range 12,000 feet a few miles off the end of the runway.

I turned into a wind of about eight to 10 m.p.h. ran up the engines, took a nervous look at Mario, breathed a prayer and started down the runway. It was amazing. We were off the ground in less than 500 feet in spite of the altitude.

Maintaining a steady rate of climb, I set a course for a pass in the hills that were fast approaching. The plane responded well and in a few minutes I was gazing down on the palace of Hailie Selassie from 2,200 feet. The altimeter said 8,900 feet above sea level and after some preliminary maneuvers I put another 1,000 feet under me and tried a few stalls. Everything seemed all right except that the fabric on the wings seemed to show a tendency to balloon away from the wing ribs. Mistake number one; I discounted the importance of this discovery. We flew around the airport, even buzzing the runway, before I decided to try a landing.

The approach is actually a slide down a tree-dotted hill almost to the edge of the runway. Everything went all right. I decided to make it a touch and go landing and try a downwind approach. This was mistake number two. But a little eight-mile wind couldn't hurt me.

I circled the field twice, studying this downwind landing. It actually seemed the more simple approach because of the greater extent of flat land at the near end of the runway. My let-down was normal and everything seemed to be in order. Buzzards picked just this moment to float along directly in front of me. Mario was jabbering in Italian and pointing at the birds. I didn't relish hitting them either.

Opening the throttles wide, I attempted to rise over the flock. I had already crossed over the end of the runway and knew that I would have to settle quickly after I passed them. I got by the flock of buzzards but was too far down the runway to attempt a landing, especially since there were no brakes on the plane. Having no alternative but to go around again, I entered a fairly rapid climb. The tail wind and the altitude were against me. My climb seemed painfully slow. On top of that, I was fast having to steepen the angle of climb in order to rise with the hill at the far end of the runway. It just wouldn't work, I could almost spot that point on the hill where I would hit the trees.

Banking right or left was of no avail inasmuch as I was too close to the hill.

(*Continued on page* 118)

Wrecked Monospar in hills near Addis Ababa crashed in overshooting a downwind landing. Mountains 12,000 feet high are but a few miles beyond runway which has altitude of 7,726 feet.

One man padded his log book, passed his flight check and moved from Cubs to Spits in one jump. The author himself received only minimum transition training, has since flown 57 types of airplanes.

Fly One -Fly All

From Cubs to Spits isn't as hard as "hot pilots" claim, says RAF flyer.

By CAPT. C. TRUMBULL, Jr.
Former RAF Ferry Pilot

SOME "hot pilots" don't want it known that flying *isn't* the superman job others believe it to be. Ask them about an airplane with more horsepower than the conventional lightplane and they will tell you that it takes off over 130 m.p.h. and then only if you pull it off, torque tosses it all over the runways, and it lands like a sack of lead.

Such talk goes on in almost any hangar but after transferring from lightplanes almost directly into combat and commercial types of aircraft, I found that so-called "killer" airplanes are usually quite civilized and pleasant to fly after a few hours aloft.

Up until 1940 I had flown nothing larger than the J-5 Travel Air. Since then I have flown 57 different types of British and U. S. aircraft and have yet to find an airplane that is truly difficult to fly if simple rules are followed. I met those airplanes in two years of ferrying for the British, doing test work for United Aircraft and in 20 months of transatlantic flying for the RAF Transport Command.

Before I left for the British flying job, I asked the local aircraft inspector what he thought of my intended position.

". . . It takes a lot of training and experience to fly these new planes," he replied in a fatherly manner." I wouldn't like to see you bite off more than you can chew and get killed over there. . . . I'd advise you to stick to instructing in lightplanes."

Had I listened to this and other well-meant advice, I probably would have never flown anything over 300 h.p. My first flight check was in a *Harvard*. Seated in the cockpit, which looked like a cross between a telephone switchboard and railroad control tower, I wondered if I was out of my class. My check pilot, an English flight lieutenant, explained the controls to me, started the engine and told me to take-off. After I felt the plane out in the air, the lieutenant took over and did some aerobatics and then permitted me to do some. I shot landings for an hour and when I landed I was as much at home in the *Harvard* as I had been in the *Cub* in which I'd been instructing.

Soon we were sent to Malton for a twin-engine check in a Lockheed "10" by Trans-Canada Airlines pilots.

Those little Lockheeds looked mighty impressive to us then for none of my group had any twin-engine time and as for myself—I'd never even been inside a multi-engined airplane. After three hours, however, we were doing fair take-offs and landings, flying under the hood, and doing safe, though not expert, single-engine flight.

By the time we left Malton, more

(*Continued on page* 86)

THE LIBRARY

NAVIGATING YOUR AIRPLANE, by Creighton Merrell; published by McCormick Armstrong, Wichita, Kans., in 1945. 92 pages. Price $2.

Here in 11 chapters, with a profusion of illustrations, is one of the most complete and easily understood books on navigation that we have come across. The sole objection (if this is an objection) is that it contains more detailed information than the private pilot may care to learn. For the commercial pilot it gives much assistance toward passing CAA examinations. The book also includes about three pages containing questions and answers taken from past CAA examinations.

As the author points out, this is a book from which navigation can be taught in the simplest and most direct manner. Page size is 8 x 11 inches, enabling him to present both a problem, the illustration and the explanation on a large surface. It contains some valuable pointers, such as proof of the little-known fact that it is impossible to break even with the wind: there are more headwinds than there are tailwinds! Most pilots think a headwind out is a tailwind back, which cancels. Not so, as anyone may compute for himself by imagining a 100-m.p.h. plane on a 100-mile flight with a 50-m.p.h. headwind. (Two hours one-way with wind, but only two hours round-trip with no wind.)

The book includes explanations of time, longitude, map projections, chart reading, instruments, wind, and problems. Some of the problems are too involved for the private pilot, but a commercial pilot will find them useful. Mr. Merrell might have included instruction in the use of a simple computer, but this minor objection is largely offset by a detailed study on the subject "navigating a cross-country trip."

The language, style, and approach are essentially what any student wants—simplicity. Mr. Merrell is out to *teach* navigation, and he accomplishes his purpose by a clear, forceful, and lucid presentation of the subject.

JOHN R. HOYT

WINGS FOR THE DRAGON, by Alice Rogers Hager; published by Dodd, Mead & Co., 432 Fourth Ave., New York, in 1945. 307 pages. Price $3.00.

Relatively little has been written about the bitter struggle the pitifully few airmen in the China-Burma-India theater made to keep its skyroads open. Miss Hager dedicates her book to these "forgotten" men who won this battle against weather, lack of supplies, and a ruthless enemy.

She tells simply and forcibly of the ingenuity and courage which alone saved early squadrons from annihilation. The various units are described in detail—the biscuit bombers, who supplied jungle troops with food and ammunition; the air rescue units; the flying nurses; the photo reconnaissance; the Hump flyers; the Flying Tigers. Difficulties in constructing airstrips for the *Superfortresses* and their initial activities are covered.

Interesting experiences of men who parachuted to safety and their difficulties in reaching the home bases are interwoven in the story of the fight for freedom, as well as colorful personality sketches of Chennault, "The Duke," Tex Hill and many others.

The last two chapters are devoted to the history of aviation in China and an analysis of the future significance of the vast operations there during the war.

At times, perhaps because of the complexity of her subject, Miss Hager's account seems to lack continuity. That she knows her subject matter well, none can deny—but her story does seem a bit too emotionally toned.

GRACE HICKOK

SHORT VIEWS

AIRCRAFT AND ENGINE MECHANICS' MANUAL, METEOROLOGY FOR AIRMEN, AERONAUTICAL TRAINING, all by Charles A. Zweng; published by Pan American Navigation Service, 12021 Ventura Blvd., North Hollywood, Calif., in 1945. Price $3 each.

The mechanic's manual, comprising 230 pages, is slanted to the mechanic who intends to take CAA written A&E tests. It includes illustrations covering major and minor repairs and a typical multiple choice examination—with correct answers provided.

A simple guide for pilots seeking an instrument rating, the 231-page manual on meteorology reduces the technicalities of this subject to laymen language. Questions and answers for both student and instructor are included.

General aeronautical training is adequately covered in Zweng's 252-page book on this subject. Discussion of flight maneuvers and written examinations for all classes of licenses make this manual a valuable asset to both private and commercial pilot.

PROSPECTS AND PROBLEMS IN AVIATION; published by the Chicago Association of Commerce, 1 North LaSalle Street, Chicago 2, Ill., in 1945. 212 pages. Price $2.

This book is a collection of 12 papers given by aeronautical experts at the Chicago Forum on Aviation, sponsored jointly by the Chicago Chamber of Commerce and the University of Chicago. Two other discussions, not given during the forum, are also included.

The 14 chapters cover the growth of the aircraft and air transport industry; prospective expansion of airline routes and services; cargo aircraft of the future; rates; prospective passenger and cargo traffic; future of aircraft manufacturing; airport location, design and financing; competition; regulations and taxation of air transport; and control and operation of air transport in relation to other forms of transportation. END

FLYING

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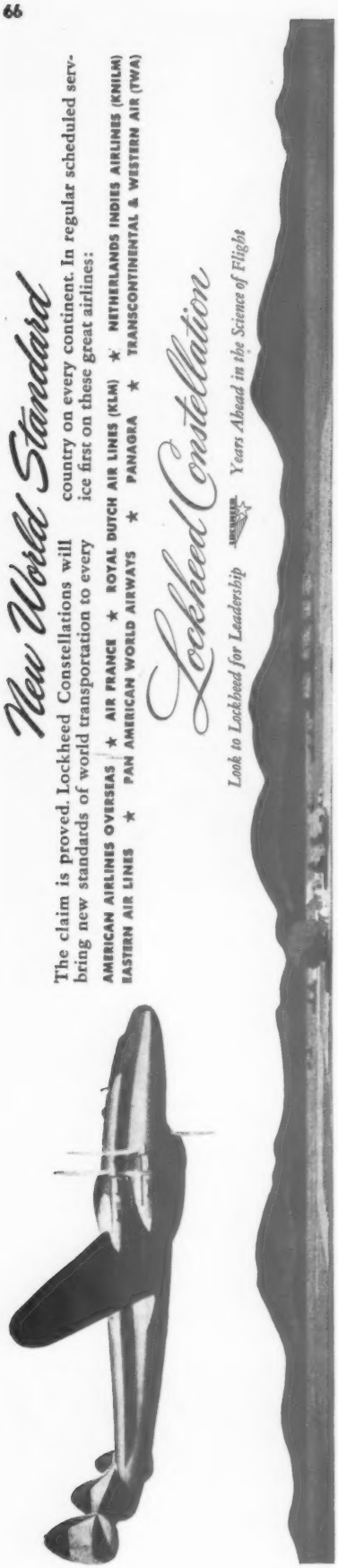

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Letters

Reader comments should be addressed to Letters Editor, FLYING, 185 N. Wabash Avenue, Chicago 1, Illinois. All letters should be signed. Names withheld upon request.

FROM ADMIRAL KING

I am providing you copies of correspondence between Sen. Elbert D. Thomas, author of ". . . The Same Mistake Again?" appearing in FLYING's December, 1945, issue. In my letter to him I have pointed out the inaccuracy of his statement that I, at the beginning of the war, remarked that "Army aviation should end at the shoreline."

At no time have I ever made such a statement. I am sending you this correction for your information.

ERNEST J. KING,
Fleet Admiral

Washington, D. C.

● FLYING regrets this misquotation. Correspondence copies referred to by Admiral King indicated that the remark in question was originally attributed to him by William Bradford Huie, in Huie's book, "The Fight for Air Power," from which Senator Thomas obtained information included in his article. The admiral referred to was actually Adm. William E. King.—ED.

RECORD FLIGHT QUERY

Accounts of a *Superfort's* record nonstop flight from Guam to Washington stated that almost half the initial gross weight of the aircraft was in fuel. In an interview Colonel Irvine, the pilot, stated that near the end of the hop he feathered the number 1 engine to save fuel. With all that gas why did he have to feather it, and why an outboard instead of an inboard engine?

A. B. YOUNG, JR.
Army Air Forces

Columbia, Mo.

● Plane had only a little over 4,000 pounds of weight removed. Original flight plans called for 40 per cent power to keep gas consumption low. Need for increased altitude, cold weather and low throttle setting caused engines to vibrate excessively. Pilot decided to cut out number one engine because it was showing signs of oil trouble and to run up the other three, eliminating vibration.—ED.

MORE ON STALL LANDINGS

I wish to comment on the statements in the Letter's column regarding Hoyt's article, "Is the Stall Landing Obsolete?" by two officers of the Marine Corps. I firmly believe these two Marines are recovering from injuries sustained from one of those landings they mentioned which started from a greater height than three feet. Or perhaps they're still flying N2s or N3N8s.

Have they ever landed an R4D (DC-3) or R5D (DC-4) fully loaded according to military requirements, 28,000 pounds gross and 68,000 pounds gross respectively, from a greater height than three feet? Definitely not, or they wouldn't be writing to you.

LIEUT. JOSEPH N. CLESI, USNR
San Francisco, Calif.

I heartily object to FLYING's recent articles on the relative merits of wheel and full-stall landings. Anyone who flys knows that both types of landings are perfectly acceptable and that one has advantages over the other only under specified conditions. A pilot should be proficient in both.

Such articles make the simple act of landing an airplane appear as a profound and complicated problem—enough to make the prospective aviation enthusiast quickly invest his money in a new automoble.

FRANK B. CHAPMAN
New Orleans, La.

SILVER BOOT CLUB

Can you inform me as to the headquarters location of the Silver Boot Club, membership for which is confined to airmen who bailed out over enemy territory and walked back to Allied lines.

I was shot down behind the German lines in Italy, parachuted to safety and later returned on foot to Allied control after successfully evading capture.

LIEUT. WILLIAM E. MOFFET
Romulus Air Field, Mich.

● The Silver Boot, or Late Arrival's Club, was formed in Cairo, June, 1941. Manufacturer of the club's emblem, a silver flying boot with winged heel, is Jean Fondian, Sharia Soliman Pasha, Cairo, Egypt.—ED.

OBJECTION

Your use of that picture of a smashed *Luscombe* with your article "Stop Blaming the Pilot!" in the February issue was unfair. While the accident was clearly a taxiing mishap by two pilots, your caption did not make that fact clear. . . .

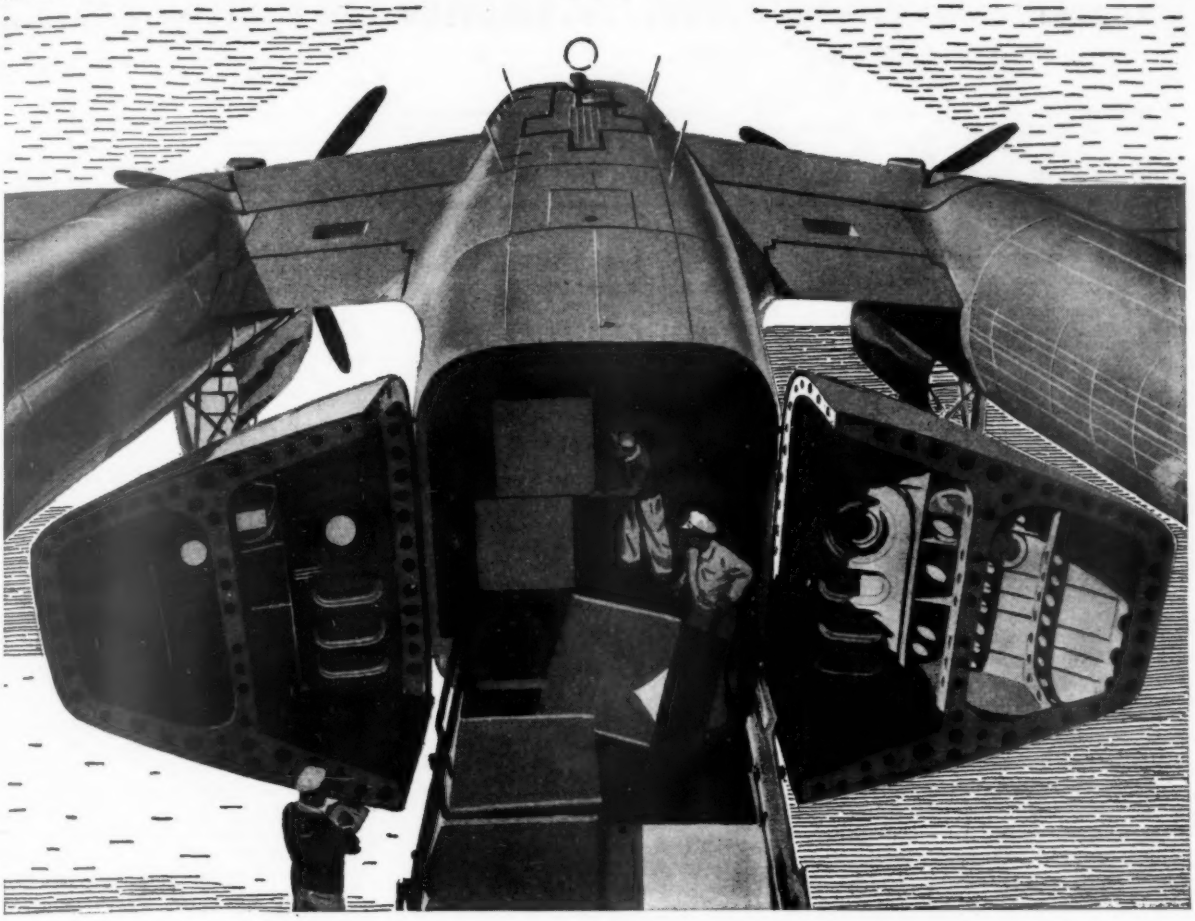
A PRIVATE PILOT
Dallas, Tex.

● This was clearly a taxiing accident. FLYING regrets the inference that it occurred in flight.—ED.

POOR JUDGMENT?

In "I Learned About Flying From That" FLYING's January issue, John Gordon Bennett said that suddenly, near Fort Plain, the visibility and ceiling "dropped like a theater curtain." What happened to his judgment and common sense? Why didn't he turn back when his plane wasn't properly equipped for instrument

(*Continued on page* 116)



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AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

The Aircraft Owners and Pilots Association (AOPA), with National Headquarters Office located in the International Bldg., 1319 F Street, Washington 4, D. C., is a non-profit organization composed exclusively of pilots. It looks after the pilot's best interests in all phases of aviation and helps individual pilots with their individual problems. The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is edited by the Aircraft Owners and Pilots Association and opinions contained in it are not necessarily those of FLYING. A special bulletin is sent each month to all registered AOPA pilots and also confidential newsletters from AOPA's Washington staff are sent members from time to time

REORGANIZATION

It is reorganization time in the AOPA office this month; some shifting is required to take care of the increasing membership. Actually, this is the third time AOPA's sky-rocketing pilot registrations have made staff and space expansions necessary.

J. B. Hartranft, Jr., has returned from the AAF, where he served as a lieutenant colonel, and again heads the AOPA staff as general manager with headquarters in Washington. Alfred L. Wolf has also returned from service with the AAF and resumes his position as association secretary. Although the vacancy created by the untimely death of Lawrence Lawver has not yet been filled, appointment of a successor will be made in the near future.

Servicing work is under the supervision of M. A. Shryock, assisted in the Washington office by Charlotte Bridgman and Jo Elizabeth Stein. Geraldine Huchison is the new AOPA registrar. Other positions to be filled include a membership and promotional post and a safety engineer for the association. Clerical staffs also will be increased as their services are required.

AOPA BREAKS ALL RECORDS

According to all information available, the AOPA now enjoys a number of distinctions. First, it is the largest organization in the world composed solely of bona-fide pilots. AOPA represents more civil pilots than any other organization and is out-ranked in number of pilots only by the AAF. Spot surveys indicate that AOPA members own the largest proportion of personal aircraft operating in the U. S. Ownership of aircraft fluctuates almost as fast as complete tabulations are made, but it is estimated that the AOPA now represents a definite majority of all personal aircraft owners in the U. S. Special forms are now being printed for circulation to AOPA pilots so that a complete tabulation may be made. All members are asked to cooperate by returning the forms promptly. Another interesting record is the membership response which AOPA headquarters receives when it solicits its pilots for an opinion on some important issue. Direct-mail experts are frequently pleased with a 2½ per cent return on a mail piece, feel that they really have something if they get five per cent and have achieved outstanding success if they hit eight per cent or 10 per cent. Not so with AOPA, however. When AOPA sends out a questionnaire to its members, the returns are considered poor if they net 50 per cent. A 70 per cent return is considered normal. This indicates a fact Government agencies learned months ago: Most responsible and well informed pilots are AOPA members. Therefore, AOPA speaks with real support and authority as the voice of the private pilot and personal aircraft owner. Look for AOPA wings for they will always be worn by the cream of America's non-scheduled pilots.

NEED HANGARS FOR AN AIRPORT?

One of the most progressive steps we have noted recently is the plan presented by U. S. Aeroplane Carriers, Inc., of Wilmington, Del., to assist small airports in procuring housing for personal aircraft by providing prefabricated individual hangars on a lease-rental basis. The plan, as reported to AOPA, calls for the airport operator to pay USAC the monthly rentals collected from newly installed hangars for a period of about six years, after which the title to the hangars passes to the airport operator and rentals thereafter become his. Since under the plan no payment is necessary prior to installation of the hangars, this offer should provide quick aircraft shelter where hangars are badly needed.

ABOUT "SURPLUS AIRPORTS"

For the past two or three months increasing numbers of airports used in the war training of Army and Navy pilots have been abandoned by the military groups and are now available to states and municipalities. Private flyers are busy in many cities convincing the town fathers that many of the smaller fields should be acquired for personal aircraft owners. One of the requirements made of applicants is that all fields must be maintained and operated at all times as public airports.

Officials interested in making inquiry into the surplus airport picture should address inquiries to the Director of Disposal, Review, and Real Estate, Surplus Property Administration, Third and D Streets, S. E., Washington, D. C. Surplus trucks, tractors, snow removers, mowers, shop and office fixtures have been left at many of these airports by their former users and are available. When filing inquiries, one should be sure to specify *each* item wanted.

PILOT LICENSE REVOCATIONS

There appears to be no clear-cut understanding of the penalties meted out by the CAB in connection with various traffic and other CAR violations. AOPA's staff is undertaking a study of such actions and in future issues of the AOPA *Pilot* the results of this study will be announced.

In the meantime, to answer partially this question for the many pilots who have sent in inquiries, here are the causes which recently resulted in the *revocation* of six pilot licenses by the CAB. A commercial pilot in Ohio, while allegedly under the influence of alcohol, took off cross-wind on the wrong runway and collided with parked aircraft. A student pilot flew outside of his approved flight area at an altitude of less than 500 feet and performed acrobatics at altitudes less than 1,500 feet without a parachute.

A private pilot carried passengers for hire and, in reporting an ensuing accident, failed to mention in his report the names of four of six of his passengers who were in the plane at the time of the accident.

Three student pilots had their licenses revoked for carrying passengers.

Here are typical cases involving license suspensions. They are in the main for lesser offenses, although the length of suspension is intended to indicate in each case the general seriousness of the violation.

A student pilot received a 60-day suspension for soloing outside of the approved flight area of his instructor. A commercial pilot received a 30-day suspension for flying an airplane which had not been given a periodic inspection by an appropriately rated mechanic.

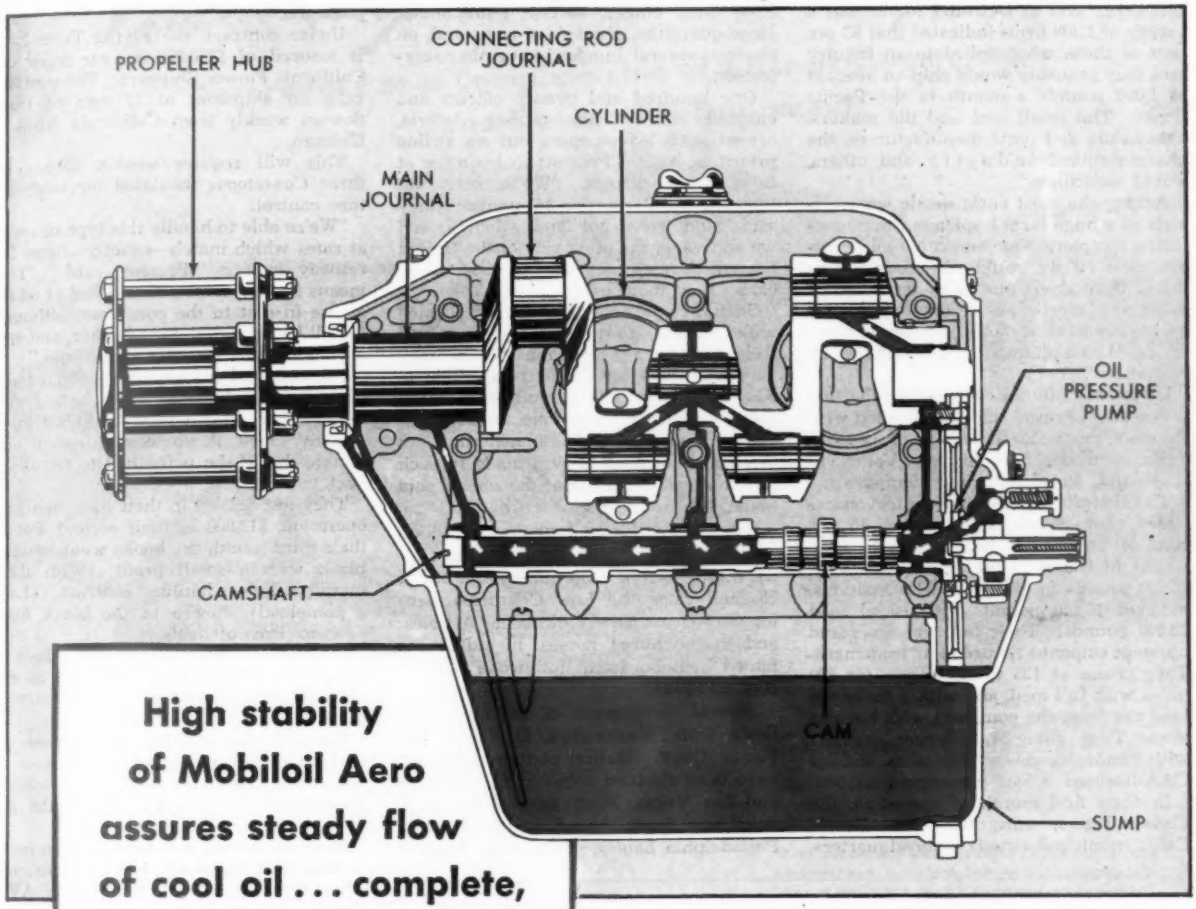
A commercial pilot allowed an unlicensed student pilot to fly an airplane and received a 30-day suspension. A private pilot was grounded 15 days for flying into instrument weather without having an instrument rating. A student pilot was grounded six months for flying during hours of darkness without lights in an airplane which was not airworthy.

NEW STARTER INTRODUCED

A mechanical starter operating without aid of an electric motor or compressed air is now available for personal aircraft owners having low-horsepower engines. At least one manufacturer, Aeronca, is expected to adopt the new starter as standard equipment. The McDowell Manufacturing Co., Pittsburgh, indicates that the starter has been approved for safety and performance by the CAA, AAF Material Command and Navy Bureau of Aeronautics. The weight is only 12 pounds installed and the starter can be used on engines up to 100 horsepower. It is actuated by a 50-pound pull on a lever installed in the cockpit. A special impulse magneto is included in the list price of $82.50 provided the plane's old magneto is in good condition and is exchanged for the new one. END

FOR DOUBLE-BARRELED PROTECTION—USE THE OIL THAT

Takes the Heat off Engine Parts!



High stability of Mobiloil Aero assures steady flow of cool oil . . . complete, continuous lubrication!

INSIDE your aircraft engine, oil must not only lubricate, but carry away heat from bearings, cylinders, pistons, gears and cams. This calls for extra resistance to oxidation at high temperatures.

Mobiloil Aero is specially refined to withstand the intense heat absorbed during circulation. Thus it resists formation of deposits which prevent transfer of heat to the oil.

Mobiloil Aero has proved outstanding in commercial and military flights covering thousands of air hours. Its success in this severe type of operation proves its suitability for private planes.

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Tune in "Information Please" Monday Evenings, 9:30 E.S.T.—NBC

Mobilgas AIRCRAFT

FOR QUALITY PROTECTION—RELY ON

SOCONY-VACUUM AVIATION PRODUCTS

The Flying Tiger Line

(*Continued from page 29*)

third of this, or 1,500,000,000 ton-miles, would actually become air cargo, it would require a fleet of 380 *Skymasters* or 830 *Skytrains*."

"That looked and sounded good," Prescott says, "and in Detroit I found that a survey of 1,400 firms indicated that 93 per cent of those who replied to an inquiry said they probably would ship an average of 1,000 pounds a month to the Pacific Coast. The small tool and die makers, automobile and parts manufacturers, the pharmaceutical industry and others, would participate."

Among the most enthusiastic were officials of a huge farm implement manufacturing company. One executive told Prescott that "if we could slash our inventories throughout our sales territory by using airplanes to assure one-day service on replacement of parts from the factory, we could pass on important savings to our customers."

Cargo was offered even before the line was ready. Fresno shippers pleaded with Prescott to fly 5,000 pounds of peaches daily from the San Joaquin Valley to Cleveland. Prescott turned them down.

The *Conestogas* have 8x8x25 feet unimpeded cargo space, with another 15 per cent of the useful load available elsewhere in the airplane. Basic weight is 21,600 pounds, gross weight 33,800 pounds, payload 10,800 pounds and useful load 12,200 pounds. Their bulbous noses and upswept empennages are their trademark. They cruise at 135 to 140 m.p.h. for 500 miles with full load, and with a three-ton load can cross the continent with but one stop. They have 24-passenger capacity with removable canvas trip-seats, and are CAA-licensed to haul passengers.

In their first month of operation, the Flying Tigers, using the Long Beach, Calif., municipal airport as headquarters, flew coast-to-coast such diversified cargoes as penicillin, 34 tons of fruits and vegetables, 17 tons of household furniture, three tons of machinery, four tons of new dress styles, four tons of California wines, 8,000 baby chicks, several automobiles, large quantities of airplane parts and, on charter, several hundred returning servicemen.

One hundred and twenty officers and enlisted men of the cruiser *Astoria*, armed with leave-papers but no airline priorities, braced Prescott in his office at Long Beach airport. "We've been out there in the Pacific for 15 months," they said, "and we've got 30-day leaves, and we all live on the other side of the United States. You've got planes that carry cargo; how about us?"

Soon five *Conestogas* took off, loaded with happy gobs. The deep-bellied freighters formed up in a "V" as they gained altitude for the tour-trip flight to New York, Washington and other cities. Similar charter trips were made later. Cost? A charge of $2,300 including tax to charter each plane was made to each group of sailors. Each of the sailors paid about $96 for the trip.

Other recent hauls: four tons of fashion model garments from New York to Chicago; four tons of tulip bulbs—first out of Holland since the Low Countries were invaded—from New York to Los Angeles; and thoroughbred horses, including the famed El Lobo, from Hollywood Park to Bay Meadows.

Several contingents of Marines were flown from Washington, D. C., to the Pacific Coast. Motion picture personnel have been shuttled between Los Angeles and Las Vegas, Nev. One of the most novel was flying the whole squad of the Philadelphia *Eagles*, professional football team, from Philly to and from Buffalo for a game.

"A passenger airline could have hauled 'em," Prescott admitted, "but we also took their entire equipment with them and that weighed more than 2,000 pounds."

This venture was so successful, Prescott related, that the *Eagles* and other professional football teams are discussing their 1946 schedules in terms of air transportation.

Under contract, the Flying Tiger Line is assured of $250,000 a year from the California Flower Shippers. The contract calls for shipment of 12 tons of fresh flowers weekly from California cities to Chicago.

This will require weekly flights by three *Conestogas* insulated for temperature control.

"We're able to handle this type of cargo at rates which match—exactly—those for railway express," Prescott said. "This means flowers can be distributed at no increase in cost to the consumer, although they'll be delivered days fresher, and will stay fresh days after their purchase."

Prescott and his associates started operations on a basis of 30 cents per ton-mile. They quoted rates of $1,600 for a capacity load flown coast-to-coast and double that if the plane had to deadhead back to California.

They lost $21,000 in their first month of operation, $12,000 in their second, but in their third month the books went into the black with a small profit. With their lucrative flower-hauling contract ($1,440 a planeload) they're in the black from now on, Prescott feels.

There is no formality in the offices of The Flying Tiger Line. Typical of the business procedures was appointing a vice president in charge of maintenance.

Prescott was chatting with Robert F. Hedman, vice president in charge of operations, about the need for a maintenance boss, ". . . maybe we could get Jack to take the job?"

Hedman agreed and without even mentioning Jack Cornelius' last name to each other they approached the former AVG line chief about joining them. To join the freighter line, Cornelius left a well-paying position with Douglas Aircraft.

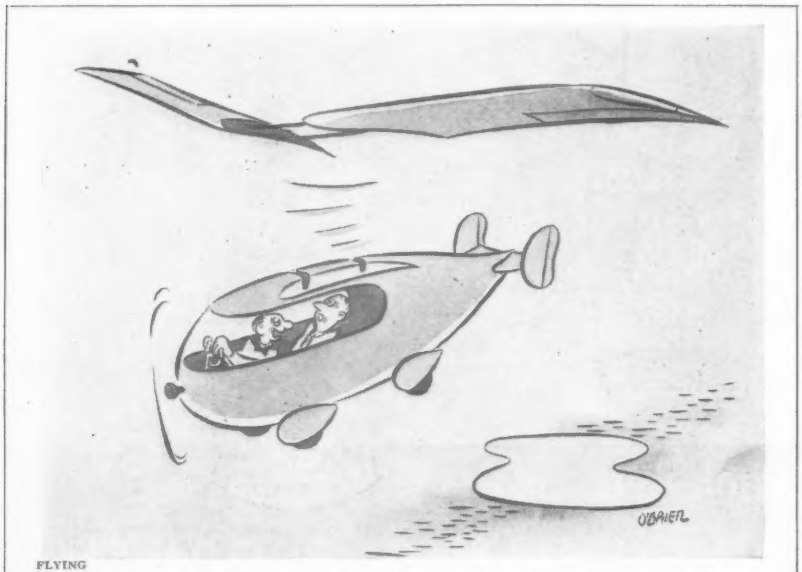
Each partner was issued stock in proportion to his investment and agreed to sell it back to the corporation if he should ever leave the outfit. All agreed to accept moderate salaries pending determination of the line's success.

"That 30 cents a ton-mile at the start was guesswork," Prescott admits. "It had to be. We had no accurate figures on operating costs, volume and all the other factors. So we did the best we could."

"Each individual hauling job was a separate contract. When we got a line on a shipper who might profit by air transit of his cargo, we went to him and tried to agree on a figure that would be profitable to him and to us. Then the job was written up as a contract.

"We've been hoping we might eventually get down to perhaps 10 cents a ton-mile—or even lower."

In the meantime, the *Conestogas* are droning a song of modern pioneering. And the Flying Tigers are flying again. END



FLYING

"—and this lever detaches the wing, converting the plane into an automobile."

Both VOICE and EARS for the private pilot

The Raytheon Radiophone

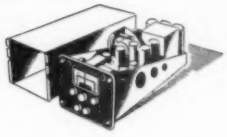
Forerunner of a Complete Line of Aircraft Communication and Navigation Equipment

Skillfully created by radio engineers whose own flying experience dictated the rigid operating specifications upon which it is constructed, the Raytheon Radiophone offers the ultimate in flight performance . . . clear cut transmitter and receiver signals for conversation between pilot, control tower and range stations . . . undistorted reception of the "beam" . . . built-in range filter . . . accurate signals from marker beacons . . . plus the convenience of standard broadcast reception.

Designed to the exacting *safety* requirements of private plane operation, the Raytheon Radiophone takes over and performs its job faithfully from the time the switch is "ON." Although it offers a host of performance advantages and features, it is noteworthy for its simplicity of operation. And despite the high standards to which it is constructed the price of the complete, compact unit has been kept remarkably low.

For more detailed information, write today.

Simplified Servicing



With transmitter and receiver combined in one compact unit, both installation and service problems of the Raytheon Radiophone are simplified. *In a matter of minutes,* the entire unit can be removed and replaced with another Radiophone.

- **Receiver performance comparable to commercial airline standards.**
- **Crystal controlled transmitter never "drifts" off frequency.**
- **Power output of transmitter—16 watts.**
- **Two vibrators—operate independently—easily switched while in operation to insure safety.**
- **Built-in loading coils eliminate extra installation.**
- **Units for either 6 or 12-volt operation.**
- **Height 4¾", width 5¼", depth 14¼".**
- **Weight 14 pounds.**
- **Equipped with range filter switch; push-to-talk on microphone; transmitter output indicator; and provision for direction finder loop.**
- **Long-life Raytheon Tubes.**
- **Ample power for loudspeaker operation.**

BELMONT RADIO CORPORATION

A DIVISION OF RAYTHEON MFG. CO.

5947 W. DICKENS AVENUE CHICAGO 39, ILLINOIS

How Good Were Jap Planes?

(Continued from page 42)

Navy airmen that the Japs were not fooling and that they were capable of turning out excellent aircraft.

The outstanding maneuverability characteristic of all *Zeke* models was made possible by an exclusion of armor and self-sealing gas tanks, which held gross weight to a minimum. The Jap philosophy of light, maneuverable aircraft never was fully abandoned even by 1945, though it continuously resulted in quick destruction of Jap planes once they were hit by American bullets. The Japs kept improving *Zeke;* the last operational model, *Zeke* 52, was capable of 358 m.p.h. at 22,000 feet. It is believed that later designed *Zekes* were in production as the war ended. *Zekes* could not approach the latest U. S. Army and Navy fighters in speed and tactical performance, but they still remained in heaviest production of any Nipponese aircraft when hostilities ceased.

The Japanese navy felt the need for improved fighters while the Guadalcanal campaign was still in effect. American Navy and Army fighters were improving and cutting down the edge that *Zeke* once enjoyed. First of these new navy fighters to appear was *Jack*, a short-range land intercepter, capable of better than 400 m.p.h.; *Jack* had excellent maneuverability and a 4,835-feet-per-minute climb at sea level, something for *Hellcats* and *Corsair* pilots to think about. Armament consisted of four 20-mm. cannon, and armor protection for the pilot and self-sealing gas tanks were standard equipment. Production zoomed on *Jack*, which began attacking *Superfortress* pilots over Japan in 1944.

As U. S. Navy pilots neared the empire in late 1944 they returned from missions reporting a troublesome new fighter. This turned out to be *George*. Unusual in design, able to accomplish 416 m.p.h. and packing four 20-mm. cannon in its wings in addition to cowling guns, *George* was a tough airplane. Armor protection was proving effective and it took many more rounds of ammunition to send *George* spiraling into the seas than it did with *Zeke*.

The Japanese army bosses were slower in developing fighter strength than the navy. *Nate* was the only army fighter known to be operational in December, 1941. First post-Pearl Harbor army fighter was *Oscar*, developed from *Nate*, a fixed landing gear type. It was somewhat similar in appearance to the navy *Zeke*, making about 317 m.p.h. at 16,000 feet. More powerful engines were soon incorporated and by 1943 *Oscars* were able to make 347 m.p.h. at 20,000 feet. In 1944 the speed was increased to 358 m.p.h., same as the later *Zekes*. A large number of *Oscars* were made.

Tojo, having some recognition features similar to the U. S. *Thunderbolt*, first appeared in China in the spring of 1943. It was superior to *Oscar* in climb and speed but for some unknown reason did not live up to expectations. U. S. pilots thought it would become very important, but production rates never were as large as on *Zeke*, *Oscar* or some of the later fighters.

Tony was the Japs' bid for an in-line-engined fighter which could match the U. S. *Mustang*. *Tony* had features similar to the German *Messerschmitt* Me-109 and the Japs certainly had the advantage of the German drawings. Early in the war *Tonys* were confused with *Hurricanes* and *Mustangs*. *Tony* had a speed of 361 m.p.h. at 15,800 feet and remained one of the most important army fighters. *Tony* 2, an improved version, appeared in 1945. It is reported to have a speed of 423 m.p.h. at 20,000 feet.

In the summer of 1944 *Frank* appeared in combat and combined most of the features both the Jap army and navy were striving for—a high-performance aircraft capable of taking it as well as dishing it out. Its 2,000-h.p. engine, four-bladed electric propeller and strong construction were a far cry from the characteristics of its flimsy predecessors. So were its twin 12.7-mm. machine guns, two 20-mm. cannon in the wing, ample armor, protected fuel tanks and bullet-proof windscreen. With a 4,275 feet-per-minute sea level rate of climb, maximum range of 1,815 miles, and 427 m.p.h. speed at 20,000 feet, it was definitely the best army fighter available, but at its best, it fell short of the U. S. Army's *Thunderbolt* and *Mustang*, the speediest in the war.

Like the navy, the Jap army had several single-engined fighters in the experimental stage. Some would have been jet- and rocket-propelled, and are now being studied by U. S. research engineers.

Irving (navy) and *Nick* (an army aircraft) were the only two twin-engined Jap fighters in the air war. *Nick* first appeared in 1942, attacking U. S. ships as well as land targets. *Irving* also first

Most Important Japanese Army and Navy Aircraft

Name	Manufacturer	Engine Type	Sea Level h.p.	Wing Span	Length	Height	Empty Weight (lbs.)	Gross Weight (lbs.)	Cruising Speed m.p.h.	Maximum Speed m.p.h.	Climb (f.p.m. sea level)	Crew	Armament	Bombs (lbs.)
FIGHTERS														
Zeke 52	Nakajima and Mitsubishi	1 radial Sakae-31	1,120	36'2"	29'10"	.....	4,236	6,026	146	358	3,140	1	2x7.7-mm. 2x20-mm.	704
Oscar	Tachikawa	1 radial Ha-115 Model 2	1,150	35'7"	29'3"	11'10"	4,210	5,650	146	358	3,430	1	2x12.7-mm.	440
Tony	Kawasaki	1 liquid-cooled	1,100	39'4"	30'0"	.....	5,010	6,982	.....	361	2,440	1	2x12.7-mm. 2x20-mm.	440
Nick	Kawasaki	2 radial	1,050	49'6"	34'8"	.....	8,335	12,213	.....	346	2,595	2	2x12.7-mm. 1x7.9-mm. 1x20-mm.	none
Tojo	Nakajima	1 radial	1,450	31'0"	29'2"	10'7"	4,300	6,100	.....	383	3,640	2	2x7.7-mm. 2x12.7-mm. 2x40-mm.	none
Frank	Nakajima	1 radial Ha-45	1,970	37'1"	32'4"	11'2"	.....	7,940	.....	427	3,790	1	2x12.7-mm. 2x20-mm.	132
Jack	Mitsubishi	1 radial Kasei-23	1,870	35'5"	31'9"	13'0"	5,178	7,080	.....	407	4,600	1	4x20-mm.	154
Irving	Nakajima	2 radial Sakae-21	1,115	55'8"	40'0"	15'0"	10,700	16,600	.....	333	1,780	2	5x20-mm.	1,100
George	Kawanishi	1 radial Homare-21	1,970	39'5"	29'4"	13'4"	6,360	9,018	178	416	4,070	1	2x7.7-mm. 4x20-mm.	265
Rex (seaplane)	Kawanishi	1 radial Kasei-24	1,825	39'4"	35'5"	.....	6,060	7,700	.....	302	.....	.....	1x30-mm. 2x20-mm.	264
BOMBERS														
Betty	Nakajima	2 radial Kasei-21	1,820	82'0"	64'6"	15'7"	17,420	27,570	131	283	1,770	5-7	3x7.7-mm. 2x20-mm.	2,200
Frances	Nakajima	2 radial Homare-11	1,795	65'7"	49'2"	14'1"	14,665	23,150	165	367	2,510	3	2x20-mm.	2,237
Helen	Mitsubishi	2 radial	1,500	66'7"	54'0"	.....	14,730	23,523	145	312	1,505	7	3x7.9-mm. 1x20-mm. 2x12.7-mm.	2,200
Peggy	Mitsubishi	2 radial Ha-42	1,890	73'9"	61'5"	18'5"	.....	30,900	147	346	1,665	7	4x12.7-mm. 1x20-mm.	1,775
Lily	Kawasaki	2 radial	1,105	57'4"	42'1"	.....	9,790	14,730	.....	310	2,120	4-5	2x7.9-mm. 1x12.7-mm.	880
Sally	Mitsubishi	2 radial	1,490	74'7"	53'0"	.....	.....	23,500	133	294	1,665	4-7	3x7.9-mm. 2x7.7-mm. 1x12.7-mm.	2,200
Nell	Nakajima	2 radial Kinsei-53	1,280	82'0"	53'1"	.....	10,900	20,400	157	270	1,570	4-7	3x7.7-mm. 1x20-mm.	1,760
Emily[6]	Kawanishi	4 radial Kasei-22	1,825	124'8"	92'4"	30'3"	37,765	54,529	.....	305	2,290	9	5x20-mm. 1x7.7-mm.	2x1,765[1]
Sonia	Mitsubishi	1 radial	930	39'9"	27'10"	.....	4,125	5,940	.....	254[2]	1,790	2	1x7.7-mm.	528
Baka[3]	Fuji-Kokuki	20 rockets	.....	16'5"	19'10"	3'9"	.....	4,536	.....	540	.....	1	none	2,645
Jill (torpedo)	Nakajima	1 radial Kasei-25	1,820	48'11"	36'2"	14'7"	6,800	11,470	.....	327	3,540	3	2x7.7-mm.	1,760
Val (dive)	Aichi	1 radial Kinsei-54	1,280	47'6"	35'5"	13'0"	5,670	8,380	.....	261	2,160	2	3x7.7-mm.	550
Kate (torpedo)	Nakajima	1 radial Sakae-11	985	50'10"	34'3"	13'6"	5,439	8,931	.....	233	1,105	2-3	3x7.7-mm.	1,760
Judy 33	Suisei, Aichi	1 radial Kinsei-62	1,580	37'9"	33'7"	10'5"	5,450	8,080	.....	376	2,750	2	3x7.7-mm.	1,100
Grace (torp.)	Aichi	1 radial Homare-21	1,970	47'4"	37'6"	.....	6,770	10,460	.....	346	2,530	2	1x13-mm. 2x20-mm.	1,760[4]
TRANSPORTS														
Mavis	Kawanishi	4 radial Kinsei-43	1,030	131'4"	82'0"	20'6"	25,600	50,700	.....	217	1,004	8-10	3x20-mm. 1x7.7-mm.	3,520
Topsy[7]	Mitsubishi	2 radial	1,065	74'0"	52'8"	16'2"	11,905	18,300	.....	278	.....	.....	none	1,694
Tabby[7]	Nakajima	2 radial Kinsei-43	1,045	95'0"	64'8"	23'4"	16,370	24,020	.....	200	.....	.....	none	2,615
RECON.														
Pete	Mitsubishi	1 radial Luisei	840	36'0"	31'0"	15'0"	4,250	6,200	.....	236	1,900	2	3x7.7-mm.	264
Norm	Kawanishi	1 radial Kasei-24	1,825	45'9"	37'7"	15'4"	9,020	10,780	.....	319	.....	3	1x7.7-mm.	.....
Paul	Aichi	1 radial Kinsei-54	1,280	42'0"	35'7"	16'6"	.....	8,792	130	285	2,440	2	1x7.9-mm. 2x20-mm.	550
Jake[5]	Watanabe	1 radial Kinsei-43	1,045	46'9"	37'3"	.....	5,820	8,050	.....	222	1,790	3	1x7.7-mm. 1x20-mm.	530
Dinah	Mitsubishi	1 radial	1,065	48'4"	36'3"	10'9"	8,058	11,882	.....	365	2,700	2	1x7.7-mm.	none
Myrt	Nakajima	1 radial Homare-21	1,970	41'1"	36'8"	12'11"	6,340	9,920	.....	396	2,600	2-3	1x7.9-mm.	1,760[1]

[1]Torpedo [2]Speed in dive [3]Suicide plane [4]Bomb or torpedo [5]Also dive bomber [6]Patrol bomber [7]Cargo & transport

"He got his training in a ball turret!"

Never before in the history of flying have so many American men and women been trained to build, fly and maintain aircraft. Even discounting those who will move to other occupations during the reconversion period, we have manpower to remain secure in the air, both from a military and a commercial standpoint.

However, other nations also have great air fleets and trained personnel. The question of who will carry the world's air commerce is likely to be the subject of international bargaining for many years to come. The nation which consistently produces planes that can be operated at a lower cost will have an "edge" in such bargaining.

In developing post-war commercial aircraft, American manufacturers will enjoy one important advantage over foreign competition. The United States today can produce more high-octane gasoline than any other nation. We have the crude oil, the refining capacity, and facilities for producing large quantities of Ethyl antiknock fluid. Commercial quantities of better-than-100-octane gasoline could readily be produced.

By developing engines to fully utilize this superior gasoline, American aviation people can give U.S. commercial planes superior performance and *economy* . . . important factors in the final determination of who shall eventually have the upper hand in peaceful competition.

Ethyl Corporation

CHRYSLER BUILDING, NEW YORK CITY

Manufacturers of Ethyl fluid, used by oil companies to improve the antiknock quality of aviation and motor gasolines.

appeared in 1942, first as a reconnaissance plane and later as a night fighter. Much greater use was made of the night fighter version which was more heavily armed and had no dorsal turret.

Baka, the rocket-propelled suicide aircraft, was launched from a *Betty* and possibly other bombers like *Peggy* or *Sally*. It carried a 2,645-pound warhead and was capable of a speed of 540 m.p.h. Range was 55 miles when released at 27,000 feet. Once these *Baka* bombs were launched they were difficult to shoot down, and Allied pilots always endeavored to destroy the parent plane before the *Baka* could be released.

SINGLE-ENGINED BOMBERS: Both the U. S. and Japs knew they had to rely heavily on single-engined dive and torpedo bombers. Each had two dive bombers, but Uncle Sam employed only one torpedo bomber against three for the Nips. *Val*, a 1937 product, dive-bombed Pearl Harbor. *Val* continued in production until late 1944 even though it could carry only a 500-pound bomb a reasonable distance. The in-line-engined *Judy* appeared as *Val's* successor in 1942; it was manufactured in a reconnaissance version also. Its 100-m.p.h. better speed, superior rate of climb, faster diving speed and doubled bomb-carrying capacity outmoded *Val* and quickly increased *Judy's* production rate. In July, 1944, a radial-engined *Judy* reached a noticeable production level and during the year replaced much of the production of the in-line version. *Judy* had a top speed of 377 m.p.h. and must be considered a successful dive-bomber from the performance standpoint. The "*Kamikaze Kids*" were using *Judys* in suicide attacks in 1945.

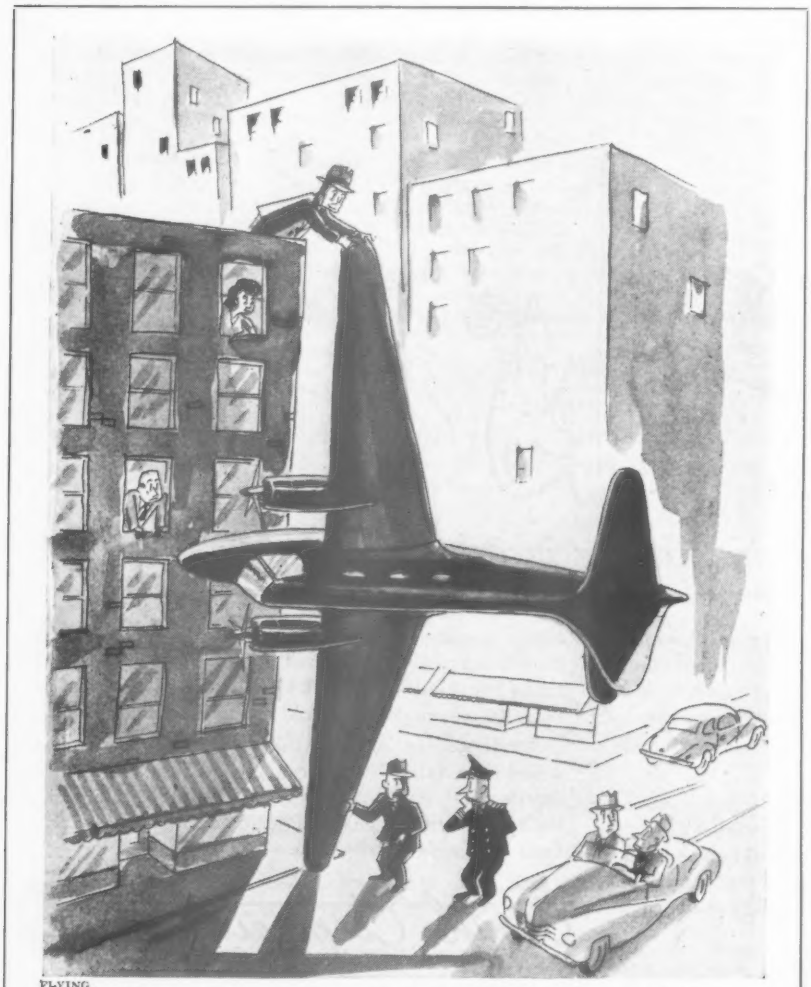
While U. S. *Avengers* were taking good toll of Jap ships, the Japs endeavored to even the score with *Kates*, *Jills*, and *Graces*, of which *Jill* was the best torpedo bomber. *Kate* was first produced in 1937 and improved versions struck at Pearl Harbor with real fury. It helped to sink the *Lexington*, *Yorktown*, and *Wasp* and participated in the Coral Sea, Midway, and Santa Cruz battles. The Japs made about 1,000 *Kates*, but during 1944 and half of 1945 depended almost wholly upon *Jill*, known to the Japs as "Heavenly Mountain." *Jill* was almost 100 m.p.h. faster than *Kate*, but carried the same 1,760-pound torpedo load. *Jill's* production was heavy during 1944 and 1945; in appearance it resembled *Kate*. Latest torpedo bomber development was the *Grace* which was in production in early fall of 1944. Only a few of these unusual looking inverted gull wing bombers were ever spotted. *Grace* was produced in limited numbers only, perhaps because B-29 raiders kept the factory workers at home.

Myrt, called "Painted Cloud," was a fast, maneuverable reconnaissance plane, equipped to carry a torpedo. It was also used for special photographic missions streaking from carrier bases at nearly 400 m.p.h. At first its tremendous speed for a three-seat aircraft amazed U. S. Navy pilots who tried to shoot it down. *Sonia*, a single-engined bomber built in both reconnaissance and bomber versions, made its debut in China in 1940. Improved engines kept it in action to the war's end, mostly in China and Manchuria where it attacked land troops.

TWO-ENGINED BOMBERS: Jap two-engined bombers were larger in size, slightly faster, but carried considerably smaller bomb loads than U. S. types like the *Mitchell* and *Invader*. Most widely and frequently used was *Betty*, which served multi-functions as a bomber, torpedo-carrier, paratroop cargo plane, and reconnaissance craft. It opened combat work in 1942. *Betty* went through four improvement stages and production remained high until the war's end. It is rightfully referred to as the workhorse of the enemy air force. *Frances*, a three-place multi-purpose bomber, was a much better performer than *Betty*. It put in its appearance late in 1943 and attacked U. S. ships at Tinian, Saipan, Guam and other central Pacific bases. In 1944 *Frances* was modified and used as a night fighter. With radar, increased firepower and high speed, *Frances* was considered more effective at night than either *Irving* or *Nick*. It can be rated as one of the Japs' best.

The Japs used *Sally* early in the war as a twin-engined bomber, but by 1944 relegated it mostly to transport duty because of its slow speed. *Nell* was another bomber used solely as a transport in the late stages of the war. It had been developed from a civilian design, was flown around the world on a "good-will mission," and saw service at Guadalcanal. *Nells* blasted the *Prince of Wales* and *Repulse* to the bottom of the sea off Malaya only three days after Pearl Harbor.

Helen and *Peggy* were the new and important army twin-engined bombers still in operation in 1944 and 1945. Naturally, with the Japs on the defense, these bombers could not be used much for offensive activities. A few *Helens* were produced in 1940 but it was not until two years later that they began to be used in any numbers. Although its maximum bomb load was under 2,000 pounds, a load easily carried by a fighter type like the *Lightning*, the Japanese referred to *Helen* as a "heavy bomber." *Peggy* was first seen over the Philippines in late 1944, although a few were produced in 1942. Its 346 m.p.h. speed at 18,700 feet was 30 m.p.h. faster than *Helen*. Some reconnaissance versions were made and some of the *Peggys* were used as suicide attackers in the waning stages of the conflict. *Lily* was Japan's first attempt



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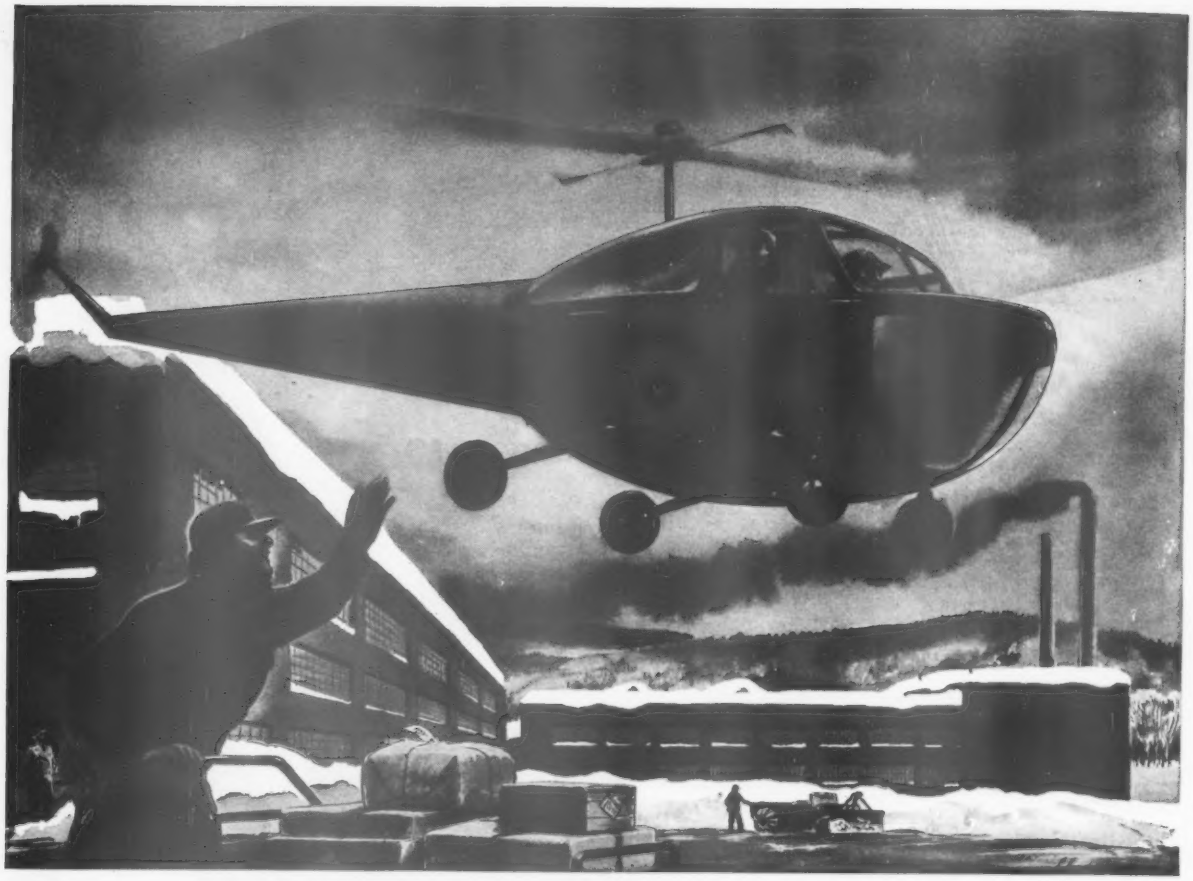

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PACEMAKER OF AVIATION PROGRESS

to build a twin-engined attack bomber in the U.S. *Havoc* class. In appearance it resembled the *Baltimore* (A-30). More *Lilys* were produced monthly than any other twin-engined types. *Lily* first appeared in 1941 in China and was confined to Asiatic operations more than the Pacific theater. A modification was made in 1944 when dive brakes were added.

FLYING BOATS AND TRANSPORTS: *Mavis* and *Cherry* were the flying boats the Nips had when war started. Neither was much good. *Cherry* was only seen a few times and apparently only a small number were made. *Mavis*, fitted with torpedoes, was extremely slow, very vulnerable, and by 1943 had been put to transport use in and about the empire. U. S. *Kingfishers* frequently destroyed *Mavises*, which proved to be such easy targets that some Allied airmen refused to claim the distinction of shooting them down.

Emily, copied in appearance from the British *Sunderland*, was much tougher to splash. Three Navy fighters aided by a torpedo bomber fired 5,950 rounds of .50-caliber ammunition into an *Emily* before it crashed. *Emily* was very heavily armed. It carried radar equipment and was an active attacker of American shipping. A few *Emilys* were transports.

Topsy and *Tabby* were the most heavily produced transports, although others played minor roles in cargo and transport duties. *Topsy* was evolved from the MC 20-commercial airliner used in Japan before the war and carried 11 passengers. *Tabby* is the Japanese version of the Douglas DC-3 with several minor modifications. *Tess*, really a Douglas DC-2, was used in limited numbers.

SEAPLANES AND RECONNAISSANCE: The Japs had to depend heavily on seaplanes for reconnaissance and observation. They had a terrific amount of territory to cover and this required seaplane bases spread throughout the islands they conquered. They also needed scouts for battleships and carriers, hence the Nips had twice as many recco planes as the U. S.

Earliest of the seaplanes was *Dave*, built in 1935 and continued in production until 1941. A few were operating in and around New Guinea at the war's close. *Pete* was designed in 1939 to replace *Dave*. It had more power and much cleaner lines. *Pete* was built exclusively as a seaplane and no land version was reported. Most spectacular of the seaplanes was *Rufe*, which was a *Zeke* on floats. Many were seen during the first two years of the war. It was about 25 m.p.h. slower than *Zeke* due to float drag but carried the same firepower and was more maneuverable than the *Kingfisher* and SOC.

Successors for *Pete* and *Rufe* had appeared by 1944 and these new float planes had much better performance and could go farther from bases. *Norm* was scheduled to replace *Pete* as a recco plane and *Rex*, prototype for the fighter *George*, was programmed to replace *Rufe*. Both of these aircraft arrived late in 1944 and neither was encountered too frequently, but their improved performance rated them far superior to the older models.

The U. S. had no twin-float types. The Japs had two in *Jake* and *Paul*. *Jakes* appeared as early as 1942, although a few were built in 1940 and tested secretly. *Jake's* main use was as a photo-reconnaissance plane, but it has also been used as a shore-based seaplane and as a catapult-operated fleet spotter. The maximum bomb load was 530 pounds. Crew was three. The Japs later brought out *Paul*, a two-seat twin float recco plane, and for several months it was believed that it would replace *Jake*, but more *Jakes* than *Pauls* continued to be manufactured until the war's climax. *Paul* was also used for dive and horizontal bombing and Admiral Nimitz once put out a warning to be on the lookout for both *Paul* and *Jake* as suicide bombers.

Dinah and *Myrt* were first-rate reconnaissance aircraft. *Dinah* was the most widely used land-based reconnaissance plane. Early *Spitfires* were unable to catch it. A *Dinah* was test flown by the U. S. at Hollandia at 425 m.p.h., while later in the Philippines a *Dinah* outran a *Lightning*.

HEAVY BOMBERS: The Japs hardly needed a four-engined land heavy bomber. They tried to produce *Liz* but apparently failed since only a few were ever seen. Another four-engined bomber coded by Technical Air Intelligence was *Rita* which amounted to nothing as far as damage to U. S. forces was concerned.

NEW AIRCRAFT NOT USED: About 15 or 20 new aircraft were under experimentation when the Japs folded. All are being fully studied by U.S. experts. U.S. intelligence knew considerable about some of these new aircraft. For example, they knew of *Luke*, a twin-boom fighter; *Patsy*, a high-speed fighter probably intended for long-range escort duty; *Rob*, a tandem in-line engine job once claimed by the Japs as capable of exceeding 500 m.p.h., and *Sam*, probably successor to *Zeke*. There are assuredly others.

WHAT DID THE JAP AIR FORCE LOOK LIKE? Here are presented 30 of the most important combat types in operation at the end of the war. The Japs have been called copyists and imitators. Being new in the aircraft production field, they surveyed the field in pre-war days as far back as 1921 to study aircraft designs of all the important nations and during the war took full advantage of captured aircraft. A study of the photographs definitely proves that the Nips designed aircraft according to their own national characteristics, just as their designers considered maneuverability paramount.

Japanese aircraft show national characteristics in all types except transports, in which field they pretty much copied U. S. types. The fighters, bombers, and seaplanes "looked different," and occasionally when Navy pilots returned from a strike and couldn't definitely identify an aircraft they had seen, they would unhesitatingly say "I don't know what it was, but I know it was Jap."

From the recognition standpoint, the Jap single-engined aircraft were generally low-wing, characterized by a prominent greenhouse or cockpit enclosure—small and far forward on fighters, high and long on light bombers. Usually they had large spinners.

In contrast, U. S. single-engined aircraft have longer and heavier noses, faired or tear-drop canopies, and tails which seem to be a definite part of the plane.

Surprisingly consistent in design, Japanese twin-engined aircraft were predominantly mid- or low-wing monoplanes with a single fin and rudder and a low flat tailplane. A long tapering fuselage with the fin and rudder "taped on" was characteristic, as was also a prominent greenhouse.

In contrast, U. S. twin-engined combat aircraft tend to be high- or mid-wing. Their engine nacelles generally extend beyond the trailing edge of the wing, while the Japs did not. The tail assemblies are more angular and elliptical.

All in all, the Japs had airplanes with workmanship, design and performance which could be respected by any nation, and the tendency of some uninformed people to scoff at them is entirely unwarranted, as the foregoing facts clearly indicate. END

The GOLDFISH CLUB

The Goldfish Club was formed to recognize the thousands of pilots and aircrewmen who have ditched their aircraft at sea and saved their lives through the use of emergency life jackets and dinghies. To apply for membership in the American division of the Club, the following information should be submitted to the American Secretary, Max Karant, Managing Editor, FLYING, 185 North Wabash Avenue, Chicago 1, Illinois:

1. Name, rank and serial number
2. Service address
3. Home address
4. Date and location of incident
5. Description of incident
6. Signature of applicant
7. Signature of commanding officer

The first 96 members of the Goldfish Club, as they appear on the official club roster, were listed in the November, 1945, and in the January and February, 1946, issues of FLYING. The listing is continued below:

97. Grimes, Vernon S., A
98. Sharum, Thomas A., A
99. Dougherty, George W., A
100. Marthoski, Leonard James, N
101. Landsdowne, Richard T., N
102. Phalon, Joseph E., A
103. Sanders, John N., A
104. Moore, Carl B., A
105. Evans, Jim W., A
106. Bleyl, Gilbert F., A
107. Briggs, Ashley L., A
108. Eckelmann, William E., A
109. Burrows, William C., Jr., A
110. Wotipka, Barney F., A
111. O'Connell, William F., A
112. Drislane, William E., A
113. Belcher, Millard E., A
114. Capshaw, David H., A
115. Mack, Charles A., Jr., A
116. Drnek, James J., A
117. Hathaway, Frank E., N
118. Boardman, Eastwood, N
119. Downey, Richard B., N
120. Such, Edward J., N
121. Wydeen, Douglas A., N
122. Maswick, Paul, N
123. Judge, Lawrence E., N
124. Varn, Thomas L., N
125. Lamphere, David E., N

A—Army; N-Navy.

The Aviation Export Battle

(*Continued from page 27*)

civil air attaches' reports, letters from buyers and those seeking agencies for aircraft products in other countries, statistics on exports of aircraft products by countries, monthly reports of sales of American surplus planes to foreign buyers, and comprehensive surveys of export trade financing, reciprocal trade agreements and competition. The export committee represents 20 AIA members and is headed by chairman J. M. Barr, export manager of United Aircraft Corp.

AIA edits and distributes to its members reports of State Department civil air attaches abroad. In addition, some American companies maintain export sales departments with representatives in many foreign countries.

Objectives of the AIA and the SBAC are identical—cornering the major share of the export trade in aircraft. But there, similiarities end.

With its British governmental backing, SBAC has an adequate publicity budget and publicity staff. The British have no large domestic market as do American manufacturers and consider it more important to develop an export business.

In America, the AIA is independent of the Government but receives help and information from several of its departments. It has neither the prestige of full Governmental support nor advertising budget. Nor are members of the Aircraft Industries Association strongly united for export business for they know there is an immediate large domestic market at home and that export sales, for the most part, are only a potential.

Some American manufacturers believe that the domestic market should be supplied before any new orders are accepted from foreign countries. Those who disagree argue that if the U. S. neglects export trade now, Britain will have a free hand in the export market and may corner a lion's share of the business.

To prevent such a situation it has been suggested that U. S. manufacturers with export business produce airplanes on a 75-25 or 60-40 basis, with the smaller percentage earmarked for foreign customers.

The unanimity of purpose that marks SBAC is not as strong among companies in AIA. Part of the job of the AIA export committee, of which John H. Payne is director, is devoted to compiling facts and figures that will help convince certain manufacturers that the British challenge in the export field should be accepted now.

A small minority in the industry feels that a campaign to sell American planes abroad is unnecessary, that foreign countries will buy our commercial and private airplanes because they will be superior in performance, speed, climb, payload and safety. But, the British have the same conviction about their planes.

Great Britain will compete—and it also may be the no-hold-barred type of competition that will include offers to train a country's air personnel in exchange for orders, full utilization of the advantages of the sterling bloc areas and the Imperial preference system, and establishment of international airlines that would operate as units of the British nationalized airways. Political pressure by the British also may help SBAC in its marketing program.

American aircraft manufacturers may not to be able immediately to cope with British competition in some areas, especially in countries where the sterling bloc is established and in others where Empire tariff concessions are granted. A large area of the world, including some of the better prospective markets for U. S. planes, is under control of the sterling bloc, which means that Great Britain has the first chance, because of monetary control, to supply these markets.

But Great Britain is compelled by the terms of the 4.4 billion dollar loan agreement recently approved by the House of Lords to set about relinquishing her tight hold in the sterling bloc areas. Within one year after Congress approves the loan, Great Britain will be expected to permit countries now under sterling control to use its dollar balances for the direct purchase of planes or other goods offered by U. S. manufacturers. Thus, the way is cleared for wiping away trade barriers in potential markets.

The strong competitive situation that is shaping up is only one problem confronting U. S. plane builders who are banking on a large volume of export business. Of immediate concern is the manner in which we dispose of surplus American airplanes overseas. Selling such surpluses on an "as is, where is" basis has been attacked by the AIA as detrimental to U. S. prestige and the reputation of the original producers of the planes. AIA has recommended to the State Department that no surplus aircraft sold for use abroad should be turned over to foreign operators until they are covered by an airworthiness certificate or by a Government-sponsored certificate of airworthiness. Under the "as is, where is" selling, declares AIA, some foreign operators, for reasons of short-sighted economy or lack of proper shop equipment, may attempt to put unairworthy aircraft into operation. "The inevitable, resultant accidents will seriously damage the reputation of the producers of such equipment, our national prestige and the American aviation industry as a whole," the AIA insists.

The Office of the Army-Navy Liquidation Commissioner, which has been transferred to the State Department and now operates under the name of the Foreign Liquidation Commissioner, has taken the view that it is more important to sell surplus aircraft as quickly as possible so

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AN ingenious GI has devised auxiliary wheels for taxiing or towing Douglas *Skytrains* and *Skytroopers* with flat tires. Designed and constructed by M/Sgt. Raymond D. Johnson of the 76th Troop Carrier Squadron, the gear utilizes scrap parts and wheel assemblies from the CG-4A glider.

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that foreign air lines can get back on their feet, for by helping them now, a good market for new U. S. planes later on is assured.

The United States position in the world export market has been considerably strengthened through the Lend-Lease program. It is believed that our plane manufacturers have won a competitive advantage because of the introduction of a wide variety of American products into many former British-dominated markets. This opening wedge should be capitalized in our search for export plane markets.

The Bureau of Foreign and Domestic Commerce reports that in 1937 the United States produced aircraft and parts, including engines, valued at $140,095,000 and exported items worth $39,404,000, or 26.8 per cent. In 1940, production was valued at $556,128,000 and the value of the amount exported was $311,871,000, or 56.1 per cent. With the introduction of Lend-Lease, wartime exports of aviation equipment skyrocketed.

The AIA export staff has for many months been probing post-war export possibilities and relaying all information along to manufacturers. The findings of these studies, based on reports from foreign countries and conferences with numerous technical commissions arriving in the U. S., point to a vastly expanded market for aircraft of all types. It is, however, a market that needs more airports before it can use many more airplanes. It also needs smart salesmanship to combat inertia and political influence. The British program appears to be designed to cope with just such problems.

One of the brighter phases of the export market picture is that U. S. manufacturers can out-produce the British. Although the so-called sterling bloc under British influence or control is recognized as a threat to U. S. export sales volume, the British will be handicapped for a time by limited production. Their inability to produce on a large scale will, therefore, limit the British trade influence in some markets.

Financing export plane sales also has been explored by the export committee. Before the war, the aircraft industry did virtually all its foreign business on a "cash-on-the-barrel-head" basis.

In the future, to meet the competition of foreign exporters who will be willing to grant extended credit terms, U. S. plane manufacturers will turn to the banks. Commercial banks will handle such items as letters of credit, drafts, collections and exchange transactions, but they will not extend credit unless endorsed by an accredited seller.

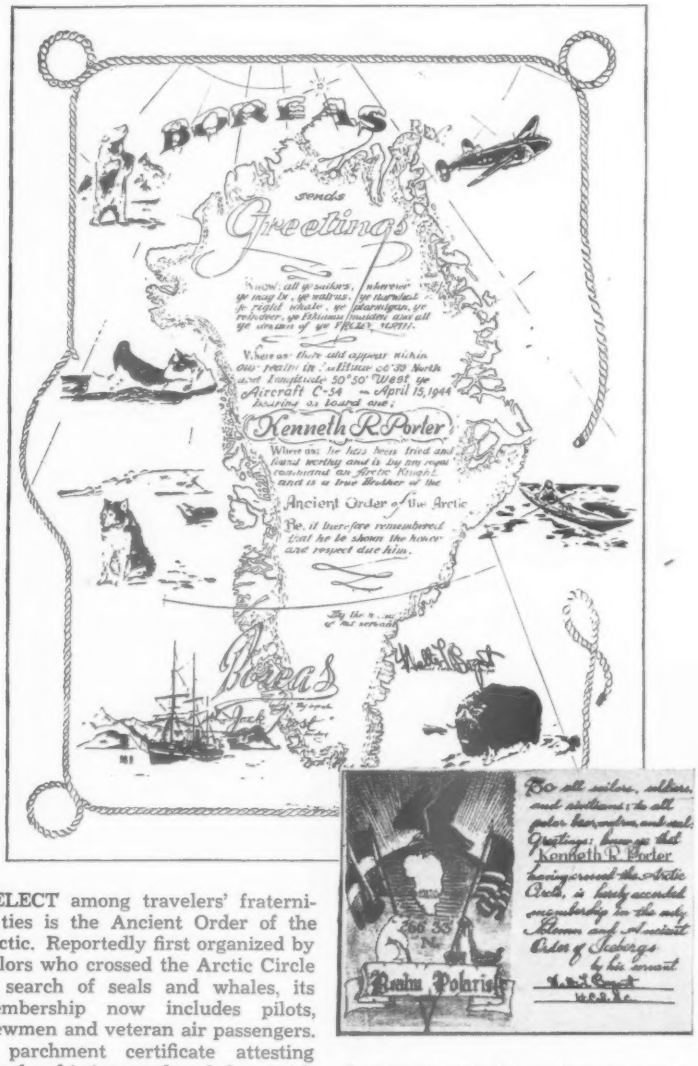
The Export-Import bank will be utilized by aircraft exporters who want exchange risks covered. The Export-Import bank will share the risk up to the extent of the exporter's profit, which may range from 15 to 25 per cent.

The bank's regulations are amply flexible to permit them to cover widely varying conditions. Its facilities are available to exporters in this country, to foreign governments and their agencies and to foreign firms and individuals if endorsed by their governments. The bank may make credits available to foreign governments, in which case sales of airplanes would be made for cash without liability to the exporter. Denmark recently borrowed $20,000,000, which is partially available for the purchase of aircraft. A loan of $1,000,000 was made to TACA of Panama specifically for the purchase of aircraft.

The bank also has approved loans to the following countries for the purchase of aircraft and aircraft parts: France, 550 million dollars; Belgium, 100 million dollars. Loans pending are: Norway, 50 million dollars; Greece, 25 million dollars; Netherlands Indies, 100 million dollars; Poland, Czechoslovakia, Italy and China, amounts large but not yet determined. The bank's value to the aircraft manufacturers is that it definitely removes finance as a competitive factor in foreign trade.

The export market is secondary to the vast domestic market for American planes, but as a secondary market it will provide a good share of the income expected to keep our aircraft industry at a high production level. This can be accomplished if the U. S. can secure and hold 30 to 40 per cent of the export market—a share that appears to be possible if a vigorous sales program is soon undertaken. END

Ancient Order of the Arctic



SELECT among travelers' fraternities is the Ancient Order of the Arctic. Reportedly first organized by sailors who crossed the Arctic Circle in search of seals and whales, its membership now includes pilots, crewmen and veteran air passengers. A parchment certificate attesting membership is reproduced above with the small identification card, right.

The mother lodge was an emergency landing strip built on Arctic tundra on the west coast of Greenland at latitude 66° 33′ north and longitude 50° 50′ west. In 1941, memberships were conferred at this isolated spot by Col. Bernt Balchen, famous Arctic flyer, when he and about 700 other men went there to build an airfield.

The "Ancient Order" is likely to remain quite exclusive, since less than one out of every 200 aircraft crossing the north Atlantic land on this desolate arctic field.

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The Atom and Aviation

(*Continued from page* 21)

atomic energy in a railroad ticket to run a passenger train several times around the earth.

But airplanes are not run by steam engines though it is conceivable that they could be. If so, a large plane might be run by a steam engine using a fuel that weighed only a few ounces. However, since the fissioning of the atom nucleus yields an explosion of energy as well as heat, we like to think that spasmodic releases might be harnessed to push pistons or turn turbines directly. Even more logical would be the use of atomic heat and force in jet-propelled planes. But all this is still in the realm of imagination.

Another obstacle to the use of nuclear energy in planes is the deadly unharnessed particles that, like the X-ray and the emanations of radium, flying wild, will maim and kill. Since these particles travel at incredible speeds through ordinary substances, human beings must be protected by shields around the atomic power plant. The shields are very thick and often weigh many tons—hence they are too heavy for airplanes. Before pilots and passengers can be in the same plane with the splitting nuclei, some method of neutralizing these devastating particles must be found that will not require great weight. Planes driven by atomic energy are not yet within the realm of realism.

The first expected use of atomic energy in aviation is as a load in the form of an atomic bomb, carried by a rocket which is propelled by other means. That is the way the Germans would have used it if they had produced the atomic bomb first. The German V-2 rockets from the coast of Holland, with atomic warheads would have destroyed Britain. In the next world war, atomic rocket bombs certainly will be used unless prohibited by international agreement. They may come over the Atlantic Ocean or the North Polar regions in 15 or 20 minutes traveling at a height of 500 miles or more.

That such rockets may be propelled by atomic energy is a possibility, since atomic explosiveness seems adapted to rocket propulsion. Since humans will not be in the rocket, shields against the injurious emanating particles will not be needed. If atomic energy is adapted to propelling rockets, then robot planes may also be so powered. It is then only a step to planes with passengers—a step, however, that rests on protection from the radioactive substances.

If atomic energy can be used to drive planes, and if the weight of the power plant and fuel is very little, then the trend toward sonic speeds and beyond will be accentuated.

Furthermore, if atomic energy is derived from cheaper and more common substances than uranium, the costs of such power in aviation may be very low. That such is a possibility is indicated by the theory that energy from the sun comes from combining, not splitting, common hydrogen atoms into helium. Of course, the cost of power is only one element in the cost of aviation. Yet cheaper, faster and longer flights would greatly increase the utilization of airplanes.

Such then are the prospects of the use of atomic energy in powering aircraft. These prospects are highly speculative and not to be realized in the visible future. Yet they are not improbable. Radio broadcasting was highly speculative 50 years ago.

The preceding paragraphs concerned the direct use of atomic energy in aircraft. There is another indirect and curious way in which the atom may affect aviation. It is through the dispersal of urban populations.

The greatest issue so far raised by nuclear fission is what to do about the atomic bomb. A dozen bombs of the present type—and perhaps one of the super bombs of the future—could kill all the residents of the city of Chicago. Such a possibility suggests two solutions. The first is for the nations to agree not to use the atomic bomb in war. The second is to scatter the urban population.

To agree not to make bombs is much simpler than moving cities; and such an agreement may be made. But if the nations of the world agree never to use atomic bombs in any future war how do we know such an agreement will not be broken? The breaking of treaties is hardly unknown. The Pact of Paris was broken a decade after the nations had signed it to outlaw war. The League of Nations failed to prevent wars. If the prohibition of atomic bombs fails cities will be faced with destruction, for no defense against the bomb is in sight. Then we shall be thrown back to the very difficult task of scattering the urban population. Let us examine this proposal and see how it may be related to aviation.

If a big city were broken up into widely scattered towns and villages there would be safety from bombing. To break up all our cities of over 50,000 inhabitants into cities of that size would cost about as much as the past world war—300 billion dollars—and perhaps less than another such war would cost. Aside from monetary cost, however, the task is so stupendous that the suggestion to disperse our city population will be considered unrealistic.

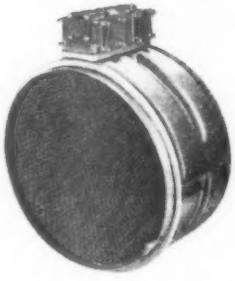
If it were done we should lose the advantages of our great metropolises, such as markets offering many selections of luxury and special goods, large flexible labor markets, large industrial plants with nearby subsidiaries, cultural advantages, and easy contacts for large numbers of business and professional leaders. Such advantages are not easily had in towns and villages.

The reason big cities have these advantages is that they have cheap transportation with frequent schedules. The type of transportation found within cities does not now exist between towns. Within a city, a ride on a bus or a street car costs from five to 10 cents. But commutation tickets between suburbs and the central city cost more. If the towns are 50 miles apart the ticket may cost more than a dollar and schedules are likely to be in-

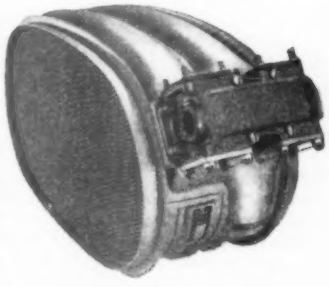
AiResearch Oil Cooling Systems

ON LEADING AIRPLANES

DOUGLAS SKYMASTER
13" Aluminum Oil Cooler. Weight 39½ lbs.



BOEING STRATOCRUISER
16" Aluminum Oil Cooler. Weight 35 lbs.



LOCKHEED CONSTELLATION
Aluminum Elliptical Oil Cooler (220 sq. in. cooling area). Weight 35 lbs.

AiResearch leadership in the aircraft oil cooling field was well established before the advent of war. So much so, that by war's end *more than half the total aircraft tonnage produced for the Army Air Forces had been equipped with AiResearch oil cooling systems.*

AiResearch was *first* to produce the thermostatically controlled oil cooler shutter, *first* to perfect the elliptical oil cooler, *first* with surge protection, *first* with electric flap control, *first* to fulfill government specifications with coolers over 16 inches in diameter and *first* to build a standard Army-Navy four port valve.

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frequent. Urban planning is transportation planning.

This point may be illustrated by considering an example. Take a city of 500,000 population occupying an area of 100 square miles. If this city were broken up into 10 small cities of 50,000 each and scattered over an area of 10,000 square miles, no city need be closer to another than 50 miles. There would then be a measure of protection from bombing. But travel among the populations of the 10 scattered small cities would not be as easy as when they were together in one big city. Still, if there were fast, cheap and frequent transportation between each of the 10 small cities, with no one further away from another than 140 miles and most of them within 50 miles of each, there would be no essential difference in convenience between the 10 small cities and the one big city. That is, one big city occupying 100 square miles would be the same as 10 small ones scattered over 10,000 square miles—if the transportation was as good in the latter case as in the former.

Airplanes can provide fast enough transportation between towns 50 miles apart, especially with helicopter buses at speeds of 150 m.p.h. or faster. Such craft, being small and fast, might also provide frequent enough schedules, and for special demands there would be private air-taxis. The real difficulty, however, would be cost. It hardly seems imaginable that interurban air transportation ever will be as cheap as intracity bus and street car transportation. Not all intracity travel is as cheap as bus fares. Many citizens use auto taxis at prices of 30 cents to, say, $1.50 a trip. Travel costs within the small cities would be low. As to the possibilities of cheaper intracity air travel, air passenger costs per mile may, with present fuels, come down slowly, though they are likely to be higher for short than for long trips. If atomic energy should ever be extremely cheap and be used to power aircraft, then cheap interurban air travel would be here with all its important social implications.

We hardly expect that our big cities will be broken up into scattered towns and villages by planned Governmental action before another war, although they should be so scattered in the interests of a second line of defense backing up an agreement not to use the atomic bomb in warfare.

However, our urban populations now are being broken up and scattered through entirely natural forces and without Governmental planning or action. This movement, though, is slow. The process began with the first electric street car in 1886 and was speeded greatly in the 1920s and 1930s when the automobile came into wide use.

Modern industrial cities arose during the past century at the junctures of long distance transportation lines—usually railroads, or railroads and waterways. But local transportation within the city remained dependent upon muscles. Hence, the inhabitants were packed in a radial pattern in layers around the center of the city. But today the economic pattern of the city is that of the outline of a starfish. This process of throwing the city outward is at present very gradual, too slow to provide much of a defense against bombing if a new world war comes within 20 or 25 years.

The threat of atomic bombing may, however, speed somewhat this gradual scattering of the urban population into many small cities, towns and villages over a large area. Perhaps in the course of a century or more the gradual process would accomplish what an adequate defense plan for our cities should accomplish in 10 or 15 years. Aircraft will surely speed up this outward trend of urban population—in fact, it is difficult to see how the urban population can be scattered very widely without the speed of aircraft.

Our modern cities, now so numerous that the urban population of the United States is about 60 per cent of the total, are the creation of the railroad and the factory. But local transportation, based on the automobile and aircraft, is destroying the types of cities the railroads and the factories created. Instead they are creating large urban areas dotted with small cities and an occasional metropolis, with farms in between. These areas of hundreds of small cities and towns relatively close together will be linked by fast flying aircraft which will have, of course, adequate landing spaces. Without aircraft the scatter would not be so widespread.

The fear of the atomic bomb in future wars is expected to hasten the transfer of urban populations from big cities to urban areas with cities and towns, between which many aircraft will fly. This process is expected to increase during the present decade. END

SMALL-TOWN AIRPARK

WHILE most communities are still dreaming about airparks, citizens of Alexander City, Ala., have taken an old one-directional air strip and transformed it and the surrounding area into a showplace airport and a recreational center for the city's 12,000 people.

The airfield now comprises two right-angle runways stretching 3,000 feet north-south and 2,900 feet east-west. Both are being used and a third diagonal strip is planned.

Near the hangar and administration building (lower left), which contains rest rooms, lounges, chart rooms, are tennis courts, swimming pool, picnic pavilion (lower right), barbecue pits and a 10-acre playground. Residents point out that a lake three miles away affords excellent duck hunting and that their nine-hole golf course is only one-half mile from the airpark.

Besides the addition of a third runway, the city plans to add lighting facilities and further recreational improvements.

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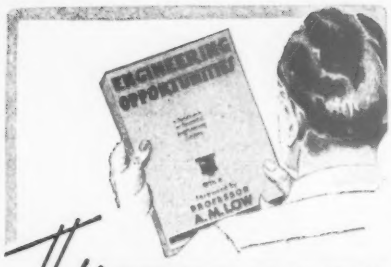

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Fly One—Fly All

(*Continued from page 63*)

camouflage had been stripped from the "killer" theory and we began to realize that, basically, one airplane was much the same as the next one. In England there was little tendency to exaggerate a plane's handling characteristics. If anything, the pilots there leaned to the other extreme. Very often the first time we'd see a particular plane was when the engineering officer would point it out in a muddy dispersal field. Assuring us it had been given its D.I. (daily inspection), he would leave us to our own devices. We who had become accustomed to being checked out even when changing from a *Cub* to a Taylorcraft, soon became used to flying various craft. We found that if the Ferry Pilot Notes were studied and supplemented with a bit of common sense there we would encounter no difficulty in flying the different planes.

In one group of arriving pilots I noticed a boy who had once been my student. I knew he had flown only *Cubs* and couldn't have the required 800 hours flying time. Later he confided to me that he had padded his log book, passed his flight check in Canada and within a month was flying *Hurricanes* and *Spitfires*. In a few more months he was checked out in all the twin-engined planes. He is now flying an Atlantic run for one of our major airlines.

Take another case of an air cadet stationed at our field. Boys 15 years old were taking ground training there in preparation for joining the air force when they were old enough. I used to take one boy on trips with me and decided to experiment with him. He was sold on flying and had not been exposed to the propaganda of the self-styled "hot pilots." He had been studying his ground subjects and although he had never had control of an airplane in the air, I let him fly an *Anson* for about an hour on a straight and level course.

After a few hours flight time he was perfectly relaxed, made shallow turns and could fly a fairly accurate compass course. Later I began letting him fly the heavier *Whitleys* and *Wellingtons*. To do this I had to let him sit in at the only set of controls and stand by him. After about seven hours he was making safe take-offs and landings in the big craft. Perhaps it wasn't a wise thing to do—but it proved to me that if flying were approached with a proper mental attitude much could be accomplished.

For a pilot to fly all types of planes he should have a fair understanding of simple aerodynamics, a familiarity with mechanics of airframes and engines, a commercial license and a sincere interest in flying. This may sound contradictory, but when a pilot gets far enough along to acquire a commercial ticket, he should have the proper background to learn rapidly from there on in. This type is generally serious about flying and not a casual Sunday afternoon airport pilot.

Assume you have access to all types of aircraft, the necessary check pilots and the above qualifications. If so, there would be no reason why you should not be taking everything from *Mustangs* to *Liberators* around with safety within two weeks. Of course about three hours of ground study per day on technical notes would be necessary, augmented by a system permitting you to check out in so many different types of aircraft in rapid-fire order.

I believe the system taught us by the British will cover almost any plane flying today with but few variations—and those minor. With slight changes here and there, this routine is used by most air forces. It goes like this: Before take-off you go through—H, T, T, M, P, flaps, gills, gas. This may sound almost childish to those uninitiated in check-off procedure, but this little drill has prevented many accidents. In explanation, "H" stands for hydraulics—check the gauge pressures and position of control levers. "T" means trim tabs—run all of them their full travel and return to the proper position, watching, if possible, their movement from the cockpit. The second "T" represents throttle friction. On some airplanes this is vitally important, for, as in a *Spitfire*, it is necessary to fly with the left hand while raising the landing gear and the throttle should stay in the advanced position without creeping. "M" is for mixture—avoid the error of taking off with it in weak or lean position. "P" is for pitch—exercise the propeller several times and set to full low or whatever setting is desired prior to take-off. Flaps should be run up and down, setting them properly if used for take-off. On most planes they are operated hydraulically and this double-checks the hydraulic function.

Gills, or cowl flaps, should be closed or set to the desired position. If the engine is liquid-cooled, use this one for radiator shutters, and if oil cooler controls are installed, set them also. The one for gas is obvious—check the tank gauges and set to proper tank or tanks for take-off. Such a process may appear somewhat involved but actually it takes only a few well spent minutes.

For landing there is a similar little jingle—H, U, M, P, flaps, gills, gas. The symbols mean the same as above, with the added U representing the undercarriage or landing gear. In Britain this is called the under-cart. Some pilots might comment that certain check features are omitted from this drill, as in the case of *Liberators* where blowers should be added, or shipboard fighters where wing-locks must be checked. Generally speaking, the above alphabetical list will hold true for all other types of planes from *Cubs* to *Fortresses*.

It is an excellent idea to walk around your plane prior to climbing in for take-off to check for insecure hatches, external control locks [see "I Learned About Flying," FLYING, May issue] or perhaps a flat tail-wheel tire. With a shortage of men resulting in overworked ground crews, such details may be overlooked and could result in embarrassing, if not

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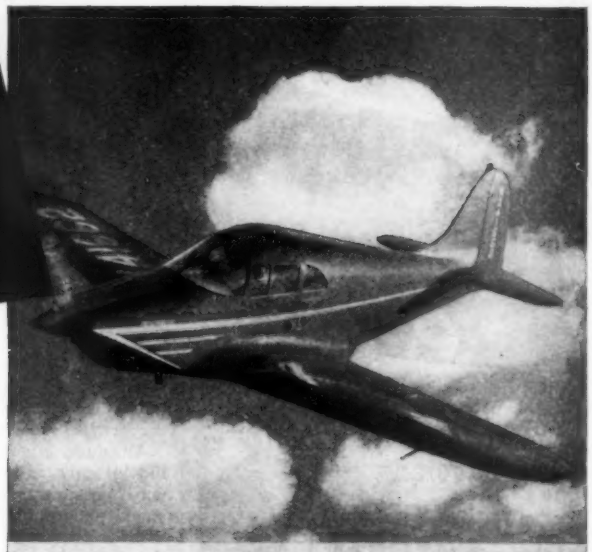

If you have recently bought a new plane, there's a good chance that your windows or windshield, or both, are Du Pont "Lucite." "Lucite" is used on many planes, among them the Johnson "Rocket" (shown above) and the Commonwealth "Skyranger." If you haven't "Lucite" now, make sure you get "Lucite" when you need a replacement. It's probably the only replacement you'll ever need.

Because you want enclosures with high *visible* transparency. *"Lucite" transmits over 90% of the light rays.*

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Because you want enclosures with dimensional stability, rigidity and light weight.

It is for these reasons that during the war every major type of combat aircraft employed "Lucite" in one or more applications.

HOW to get the best results from "LUCITE"

Whether you install your own enclosures, or have your service man do the work, you want to be sure it's done *right*. It is important to realize that "Lucite" cannot be handled like cellulose acetate. The few simple directions here, and others to follow, will assure you best results.

THE RIGHT WAY

Store in room at not less than 70° F. for at least 24 hours.

DO NOT FIT, CUT, OR DRILL "LUCITE" WHEN COLD

When you receive "Lucite" sheets for installation, never try to drill, cut, or fit them when sheets are cold. Warm the sheet to at least 70°F (room temperature). A convenient way is to store them at least 24 hours in a warm room prior to fabrication.

THE WRONG WAY

Attempting to cut "Lucite" when it is cold might cause cracks.

THE RIGHT WAY

After installing, remove paper by loosening one corner, rolling back the sheet.

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For protection during shipping, "Lucite" comes to you covered with kraft paper. Continue this protection by leaving the paper on the sheet or formed part while installing it. Except — when mounting strips or using a channel, pull the paper back an inch or so before mounting.

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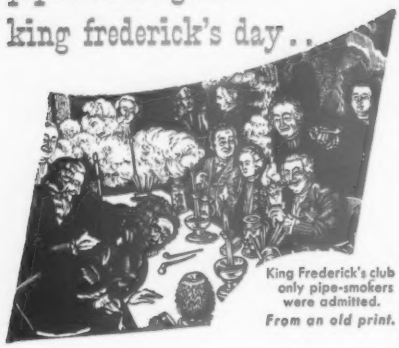

King Frederick's club only pipe-smokers were admitted. *From an old print.*

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fatal, consequences. On one occasion my crew and I boarded a DC-3 for a trans-oceanic hop. It was bitterly cold out and in my haste to get aboard I neglected checking the external parts of the big plane. While in the cockpit checking the control column movement I noticed it binding and climbed out to check up. We found the right aileron badly damaged by a gas truck that had inadvertently backed into the plane.

Had the control not been binding, we probably would have taxied out and taken off for distant shores which might never have been reached. One other thing worth checking externally is the position of the trim tabs followed by a visual check of the position of the tab indicators when in the cockpit to see if they register correctly.

Although I would discourage listening too intently to "hangar flying," it is always possible to pick out a more experienced pilot around the field to help you. With a little care you can pick him from the general run of "swivel-chair pilots." If there is something about an airplane that you don't fully understand, never be reluctant to ask questions. Most crew chiefs are willing and able to explain any technical problem that may concern a particular airplane.

One thing that will surely lead to trouble is taking airplanes for granted. There is a great difference between respecting a plane and being afraid of it. The more you know about a particular airplane the better you will fly it and your mind will be rid of doubt. However, never let familiarity breed contempt.

You can rest assured that any plane certificated by the CAA or acceptable to any branch of the flying services has no really bad characteristics although some may require more skill than others to fly. Planes like the Martin *Marauder* cannot be tossed around like a trainer, but if such a plane is understood by the pilot and common sense is used in flying it, the aircraft with the reputation of being a "hot job" cools off very rapidly.

If you possess these qualifications, follow some sort of system in your flying and don't allow yourself to become a "wise guy," you can fly them all and fly them well. Don't be intimidated by complicated cockpits—learn all you can about the plane, ask for information from reliable persons, don't take chances and take your flying seriously. END

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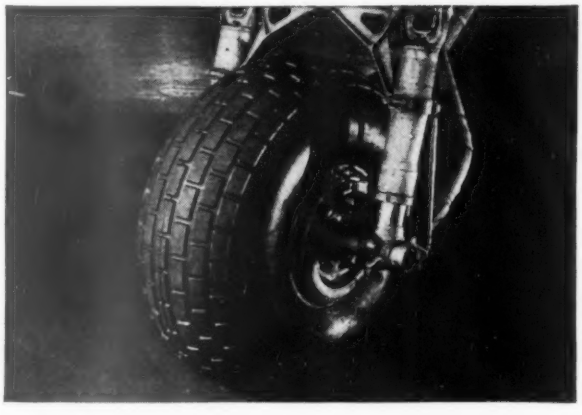

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Skyranch

(*Continued from page 38*)

"One can readily see that the sellers' market will remain unchanged for the next 10 to 15 years. To emphasize the point still further, bear in mind that no airfield in Southern California has been closed because of bankruptcy during the past 10 years.

"I think airport owners who go all-out on selling tie-down space, cornering maintenance and selling flying time, without the slightest thought of need, economy or service, are making a mistake.

"Indirect cost, such as tie-down, hangar rent, insurance and maintenance has influenced the largest percentage of plane owners to give up their planes in past years. We will aim to price our services for the greatest possible economy to owners, realizing that the long-run economic welfare of lightplane owners is to our benefit," Noir explains.

Noir told interested investors that the first-stage construction of the airport-club would cost about $117,700. He was right almost to the penny. The sum represents:

Down payment on land	$30,000
Runways, taxi-strips and street	20,000
100x100-foot hangar	15,500
Administration building and coffee house	20,000
Airplane agencies (deposit)	3,000
Power, water, air, refrigerator	5,000
Furnishings and supplies	5,000
Living quarters	6,000
Public dressing rooms	2,000
Contingencies (10 percent)	10,700
Total	$117,700

Cost of ultimate development Noir estimates as follows:

160 acres of land	$ 80,000
Runways, taxi-strips, streets, lights	46,000
Hangar	12,500
12 "T" hangars ($8,500 each)	102,000
Administration building (coffee house and tower)	30,000
Club house	20,000
Auto court (24 units)	45,000
Recreation area	20,000
Airplane agencies	10,000
Power, water, air, refrigerator	5,000
Furnishings and supplies	12,000
Contingencies (10 percent)	38,250
Total	$410,750

The 3,000-foot rolled granite all-weather runway will be the spinal column of this new development. Taxiways will branch off to the parking areas on the south. Along Valley Boulevard the business structures are to be erected.

The alluvial soil north of the runway is staked out for the residential subdivision, so situated that it will never be under the airplane traffic pattern. Private "T" hangars are to be erected along the east-west taxiway north of the runway.

Pending expansion and development the rest of the acreage is to be devoted to tenant farming. Part will be planted in an orchard, part in produce, and the balance in grain.

Noir and his associates already have contacted youth and sport groups in the Los Angeles area in an effort to sell the Skyranch as the dream "summer school" for thousands of youngsters in public school and college aviation classes during the winter. The resident school calls for accommodations for 75 students and will offer a controlled course in flight training, engines, aircraft and physical education.

The Skyranch is an airport with personality. Many transient private flyers are pleasantly pleased to go back to their planes and find them ticketed with a neat "checkoff list" which Noir's mechanics have filled out in the pilot's absence. Maps and charts are readily available. Night ground-school, known as "Weekly Roundup," is free, and open to all comers on Wednesday nights. Changes in flying regulations are neatly posted and the bulletin board is kept up to date.

Noir anticipates the first year will be a nip-and-tuck financial struggle. Profits if any will have to come from instruction revenue, from $7-per-hour rental for each of his six Piper *Cubs*, and from the 10 per cent gross fee he charges the two operators who share the field with him at present, plus whatever transient traffic he can lure into his new enterprise. Advertising and publicity campaigns are planned and the Skyranch managers expect their third year to show a profit and loss statement like the table below.

Ettienne Noir—known as Steve around the Skyranch—has lent much of the color of his own career to his enterprise. He is a vigorous 41-year-old pilot who mixes typical Southern California ballyhoo with a true love for aviation. He was born in Hungary, educated in Paris and Vienna and came to the United States in 1931 to obtain naturalization papers pursuant to becoming a U. S. citizen.

For 14 years he built up a photographic portrait clientele in Los Angeles, achieving national recognition for soft charcoal-like prints. On the side he conducted a school of photography and a camera shop.

When the war came he joined the Army Signal Corps, was discharged in 1943, and seriously began to study the operational and instructional end of his aviation hobby. He secured his instructor's rating and today has 100 students. He later formed and headed Club-Aero.

Associated with Noir at Skyranch are Arthur W. Sorare, his chief pilot and a former Army instructor, Mrs. Alma A. Bolin, woman flyer, in charge of administration. At present he has a staff of 12, three of whom are mechanics.

Noir aims to use the welfare of the private lightplane owner as his yardstick of success. He knows the more service he can offer the more successful the Skyranch will be.

"This is far from being intended as a noble, self-sacrificing attitude," he says. "On the contrary it is only looking ahead to bigger and better business which will make flying as important as we want it to become." END

ESTIMATED REVENUE: (Third Year)	Gross	Net
Tie-down for 200 planes	$12,000	$12,000
Gasoline (150 hours per year per plane—200 planes: 135,000 gals.)	33,750	13,500
Oil (Based on one pint per hour)	5,250	2,625
Maintenance ($100 per plane per year)	20,000	10,000
Plane rentals for instruction (Estimated 5,000 hours per year at $7 per hour)	35,000	17,500
Gasoline sold for instruction (5,000 hours will equal 225,000 gals.)	56,250	22,500
Oil for instruction aircraft	8,750	4,375
Approximate revenue from transient planes	5,000	2,000
Restaurant (based on serving 1,000 people per week—profit 24 percent)	52,000	12,480
Recreation	10,000	5,000
Motel	15,000	5,000
Farming (one-fourth interest)		3,500
	$245,600	$110,480
ESTIMATED OVERHEAD:		
Taxes	$ 1,960	
Salary of general manager	6,000	
Salary of chief of operations	6,000	
Office employees	4,000	
Night watchman	1,800	
Utilities	1,340	
Office supplies	300	
Advertising	1,500	
Publicity	3,000	
Depreciation and replacement	6,000	
Insurance	3,500	
Interest	3,400	
Retiring indebtedness	10,000	
Contingencies (10 percent)	4,880	
TOTAL	$53,680	
Estimated Income		$110,480
Miscellaneous Overhead		53,680
NET PROFIT	$46,800	

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GREATEST NAME IN AVIATION **DOUGLAS DC-6**

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Invasion Support—Navy Style

(*Continued from page 48*)

carefully planned, Army or Marine commanders determining how active a part they play. Sometimes they come down low and strafe only a few hundred yards in front of the troops, while other firing is lifted. But whether planes strafe or not, their mere presence overhead keeps the Japs flat at a time when our lads want to be up and doing. The infantry likes this visible means of support.

There'll not be much else in the way of support for a while—not until front lines can be established. When that happens, close support shifts to call-missions. Here's how they work: Let's say that the front lines are being held up by a very troublesome Jap battery firing from a cave. Shells only beat a tattoo on the roof of such an installation. But an airplane, making a flat run, might slip a rocket smack into the mouth of that cave. So walkie-talkie boys of an air-liaison team stationed just behind the most forward position get the request by telephone. In turn they pass it on by radio to the Commander Support Aircraft (or CSA), who is a sort of glorified train despatcher located aboard an amphibious command ship. There in the joint operations room he will be surrounded by a dozen or more officers monitoring the different nets, called SAR, ASR, SAO, SAD, ASP, LAW, and the like. The whole outfit used to be called SAC team, but latterly took on the dignity of ASCU (Air Support Control Unit) since SAC (like Cincus which became Cominch after Pearl Harbor) was as open to cracks as a summer cottage.

The ASCU gives CSA the dope on availability of fighters, bombers, photo, smoke and rescue planes, and keeps him up-to-date about changing front lines. Since the CSA can know all that and in addition talk the request over with Naval gunfire and artillery experts at hand, he has definitely the God's-eye view.

Notice that the request goes straight from the walkie-talkie boys with the battalion to the CSA. There is, however, a higher headquarters man monitoring that circuit. He can stop the request if he disapproves. If not, his silence gives consent. Which brings up a very important point in air support control—radio discipline. Everybody connected with amphibious work soon learned that gossip fouled things up. It was hardest to get the idea across to the flyers; they liked to express themselves. But, with disciplinary action, they eventually caught on. One pilot, who had lost his squadron in a rainstorm, told the world over a vitally busy circuit what he thought of his four-letter-word plane and the whole fouled-up, four-letter-word operation. But when the CSA asked crisply for the profane pilot to identify himself he replied: "I'm not *that* four-letter-word stupid!" Occasionally the Japs would break in too, shouting "Don't bomb here; don't bomb here; friendly forces, friendly forces!" but their accents betrayed them.

Now the CSA has decided, after discussion with Naval gunfire and artillery men, that airpower gets this particular job. He radios instructions to his air co-ordinator, a sort of airborne traffic cop in charge of the assorted planes orbiting at designated initial points overhead. Plane carrier bases are standing 80 miles off shore. But the planes, both bombers and fighters variously armed, are flown in to these initial points within spitting distance of the fray and circle until they are needed. The air co-ordinator, again by radio, assigns the mission to the flyers themselves and briefs them by supplying the co-ordinates on the maps they carry across their knees. If necessary, he leads in the attack, "pin-pointing" the target with a rocket or a short burst of machine-gun fire. One was so accurate with his .50-caliber bullets that his "once-over-lightly" set off an enemy ammunition dump. The dump let go, but the co-ordinator still managed to fly the tattered remnants of his plane out into the water where a Dumbo picked him up.

With the mission accomplished the ASCU circle is completed—in amazingly short order and with economy.

Too little has been said in favor of this brilliant system that sends one airplane to do one job, rather than sending 10 to cover the waterfront. In Charles Lamb's *Dissertation on Roast Pig*, an early economist burned down a whole pigsty every time he wanted roast pork. The Navy didn't have enough airplanes to play that way.

Present perfection of the support aircraft system is based on an involved history dating back to Guadalcanal days. The same salty old sea-dog who was in command of amphibious operations at Okinawa commanded the first landing at Guadalcanal—Adm. Kelly Turner. He had little in the way of precedent to go on. Of course, there had been amphibious invasions since time immemorial. But history had little to teach, because mechanization in modern warfare now permitted the defending force to bring up speedily its big stuff against invading infantrymen who were only lightly equipped during early stages of invasion. In the face of this initial defense advantage, maximum support from Navy guns was not enough. The airplane might help, but planners weren't too certain about how they were to be used.

Fresh in their memories, however, was the first amphibious operation of this war—the German invasion of Norway in April, 1940. German use of supporting aircraft will long be remembered by the people of Oslo. Nor was the part played by carrier-based aviation to support the British counter landings forgotten. It was land-based aviation which largely insured the success of Dunkirk, an amphibious operation in reverse! The terror of the Nazi air-borne invasion of Crete and the speed of the Jap conquest of the Philippines, Malaya and the East Indies under their air cover—all these were useful object lessons.

Admiral Turner, who was given supreme command of all Naval, landing, and air forces operating within the area of Guadalcanal-Tulagi, used available air power to the limit. Land-based scouting craft kept watch for snoopers; for a week prior to the landing bombers worked over the target area daily. On D-Day carrier planes arrived over the transports off the landing beaches at sunrise. When the battle was joined, the strafing and bombing planes, directed by a control unit in Admiral Turner's flagship, hit enemy troops, shore batteries, vehicle concentrations and supply dumps, while a combat air patrol broke up successive air attacks sent to disrupt the landings. The same pattern was followed during the next day.

Though the air and Naval bombardment sent the enemy in panicky disorder to the west, there was one glaring weakness of air support: Admiral Turner

15 YEARS AGO

FROM the March, 1931 issue of this magazine:

Col. Charles A. Lindbergh's new plane, a Lockheed *Sirius*, was acclaimed the fastest commercial plane in the world. With a 600-h.p. Wright *Cyclone* engine, plane's top speed was 238 m.p.h.

It was claimed that a new instrument, the sonic altimeter, would permit pilots to land safely in dense fog. Device emitted whistles at intervals of time which were registered on a dial. These intervals indicated altitude in feet.

Largest Italian plane was the Caproni 90 P.B., powered with six 1,000-h.p. Asso engines. Bomber had 130-m.p.h. top speed, 1,200-mile range, total weight of 45 tons.

The Navy Department announced that it had been apprised of plans for a German plane capable of attaining a 500-m.p.h. speed and a 40,000-foot ceiling. Plans called for non-stop flight from Germany to U.S. in six hours.

The RAF's two newest planes were the Hawker *Fury* and *Hart*. The *Fury* was a 220-m.p.h. fighter; the *Hart*, a two-place bomber with a top speed of 190 m.p.h.

Plane winning 1930 International Circuit of Europe was German BFW-M23-c, a low-wing, all-metal monoplane with hatches over cockpits. Plane was powered with a Siemens 80-h.p. engine. Wing span was 40 ft.; top speed, 104 m.p.h.; gross weight, 1,540 pounds.

Current membership in the Caterpillar Club was 338, of which 12 were repeaters. Since August of 1930, 55 members had been added to roll.

British Fairey *Firefly*, with a 550-h.p. Rolls-Royce engine, had a top speed of 210 m.p.h. at 20,000 feet.

Experiments were being conducted by M. D. Hart for British Aeronautical Research Committee to silence aircraft noises. Muffling of engine and change in propeller designs were the principal methods used.

Newest Italian fighter was the Savoia S67, a single-seat, 140-m.p.h. seaplane.

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could not determine how things were going with the Marines up front or their need of such support. Marines and Army units did not consider this situation unnatural. They were accustomed to using their own supporting weapons, going *up the chain of command* for any additional help. The Navy could not have so much leeway for improvisation nor independence of action. Because of the speed and mobility of opposing forces Naval victories can come only at a given moment in time, and naval communications have thus been designed to give the supreme commander constant check upon what every unit of his command is doing. That the Marine in the jungle was not available for consultation made Navy heads unhappy.

At this same time, half way round the world in Norfolk, Va., Adm. Henry K. Hewitt was preparing plans to land Gen. George Patton and his troops at Casablanca. Comdr. (now Captain) R. W. D. Woods, Admiral Hewitt's air officer, was studying the reports from Guadalcanal. His solution to the weakness in communications was to send an air-ground liaison team, consisting of one aviator and one radioman, in with the troops to find out what was happening and to send back word to the naval and landing force commanders. Such aviators were selected at NAS Norfolk and given special training, then attached to the staff of each regimental combat team and to the division headquarters.

The system worked like a charm. On one occasion an Army colonel whose regiment had been pinned down for several days before a casbah the French were holding, turned in desperation to his naval air liaison officer and said, "Damn it; see if you can do anything." Immediately Navy *Avengers* overhead received radio instructions via the liaison officer. Bombing had to be needlepoint, since the fortress was ringed with American troops only a few hundred yards away. Five minutes after the colonel had made his request, the *Avengers* were planting their bombs with low-level accuracy. In a few minutes the casbah flew the white flag of surrender, and the value of close air support as conceived and executed by the Navy was solidly established in that particular vicinity.

Immediately upon his return to Norfolk from Casablanca, Commander Woods made plans for further improvements. During the early stages of the amphibious operation in North Africa, he had come to realize that the battalion is in reality an independent unit of command, depending upon its own ingenuity and firepower when it hits the beach. To meet the Navy need for continuous information about everybody's front lines it was decided, then, to attach air-liaison officers to each battalion landing team, regimental combat team, division, corps, and Army to be employed in an amphibious operation.

Before the system was put into effect, Commander Woods realized that Naval aviators could be used to better advantage in flying, and that specially trained air combat intelligence officers paired with AAF intelligence officers could handle the ground job just as well. For the Sicilian landing, 13 of these teams were trained by the Navy and thrown into Virginia swamps with portable radios to learn both their equipment and their way around. Some visited the Field Artillery School at Ft. Sill, Okla., the better to understand the capabilities and trajectories of the Army's big and little guns. These teams went ashore with the assault waves of the famous 45th Infantry Division at Sicily and proved their value as a new sort of eyes of the fleet. Aboard Admiral Kirk's flagship it was possible to keep an up-to-the-minute plot on the progress of troops.

SOLO AT 83

YOU'RE never too old to learn to fly, says James W. Montee of Los Angeles, who proved it recently by soloing at Vail Field at the age of 83.

"I don't know why I waited so long to learn to fly," Mr. Montee says, recalling that he established the first commercial airport in Southern California as long ago as 1922. This was Clover Field, Santa Monica.

While his son, Ralph, formerly a first officer for Western Air Lines, watched from the ground, Montee took off on his first solo flight after 10 hours of dual. In the photo he is being congratulated by Laura Marie Thomas, 17, a fellow student.

"I just figured that if these youngsters can do it, why shouldn't I?" Montee explains. "They only had to get used to the automobile, but I have a big advantage. I had to get used to oxen, then horses, then the auto—so the airplane is something I can take in stride." Montee flies every weekend, weather permitting.

Navy support was necessarily limited in the European theater, which was primarily an Army show. But just as definitely, the Pacific was the Navy's task—and the work was developed by different personalities. Lieut. Comdr. David Scott, Lieut. Comdr. James Metcalfe, and Lieut. H. S. Hutchison, all USNR, had a great deal to do with perfecting the brilliant communications system upon which support aircraft so greatly depends. Lieut. Comdr. J. Poe Tyler and Lieut. C. W. Gill did an equally good job in developing amphibious fighter direction into one of the most important phases of the Navy's fighter direction program. The building of the highly successful air-support Air Combat Intelligence Section was under the direction of Lieut. Comdr. Harry Hollins, III, USNR. At the top was Capt. (now Rear Adm.) R. F. Whitehead, whom Capt. Ford N. Taylor, himself CSA for Luzon and other important engagements, names as the outstanding figure in Pacific Support Air. Under Captain Whitehead's leadership the tiny command, sparked largely by reserve officers, grew in importance until at Okinawa it had achieved flag rank under Adm. Melvin E. Pride.

From the moment that Captain Whitehead became CSA during the Roi-Namur invasion in January, 1944, until he relinquished the post to take command of a carrier a year and a half later, support air received energetic and minute supervision. Under his direction Navy air power supported invasion after invasion across the breadth of the Pacific.

At Tarawa, Navy air liaison officers, who had seen service in the Aleutians after their Norfolk training, confirmed their value in Pacific island warfare. Thereafter, Navy-trained Marine and Army Air liaison officers were used.

At Kwajalein, rockets were first used by Navy amphibious air.

At the Marshalls, too, landing-force support aircraft control teams were tested. By the time we reached Okinawa such shore-based control was invaluable. The preliminary development of these units was largely the work of Lieut. Price Berrien, USNR.

At Eniwetok, our advancing troops would find Jap defenses piled high with bodies riddled by .50-caliber slugs. There Navy air support was extended to a period of three days.

At Hollandia, air support control teams sent by Captain Whitehead supported the April, 1944, landings.

At Saipan, AAF *Thunderbolt* flyers were brought in on jeep carriers (they could be flown off the decks, if not back on them) and based at recently captured Aslito airfield. Navy ACI officers indoctrinated them in Navy support methods, and soon they learned to do it the Navy way, becoming adept at rocket firing.

At Saipan, again, the Marine 5th Amphibious Force worked out the parachute dropping of supplies, a refinement which later saved the forward elements of the 24th Corps who got out ahead of their supplies at Leyte.

At Guam, where there was the heaviest concentration of air and surface bombardment ever used in an amphibious operation up to that time, Comdr. (now Captain) Shirley Miller developed new techniques for the co-ordination of Naval gunfire and airplane bombing, further expanded at Leyte by Captain Taylor to include artillery fire as well.

At Tinian the Navy's new fire bomb was employed against Jap troops.

At Palau and Morotai the support missions were divided between the CVE fly-

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ers and the Marine pilots based upon Peleliu airstrip. The Marines would take off within gun range of the enemy, fly the short distance to Bloody Nose Ridge, deliver their supporting fires, and return in an amazingly short time.

At Palau, a CVE with escorting destroyers, destroyer escorts, and air squadrons, specially trained as a team in antisubmarine warfare came into being. Here the strategic support of Adm. "Bull" Halsey's 3rd Fleet Carriers revealed the weakness of the Japs in the Philippines. The invasion of Leyte resulted directly from Halsey's discovery.

At Leyte, 18 CVE (or Jeep) carriers under Rear Adm. "Tommy" Sprague supplied the bulk of the air support, though fast-carrier planes participated in support during the early stages of the invasion. Those Navy planes supported MacArthur, not for one day or three, but for an entire month!

At Dulag, Vice Admiral Wilkinson asked the CSA for smoke. The boats were catching hell from artillery lodged on Catmon Hill. Captain Taylor gave them a covering blanket in six minutes!

At Luzon, support was handled smoothly by Captain Taylor in exactly the same manner it was delivered at Leyte. To be frank, little more could be added.

At Iwo Jima, in February of 1945, support planes sprayed disease-ridden areas with DDT, the new wonder insecticide. They also sprayed Japs with lead during 9,000 sorties.

At Iwo a specially-trained, carrier-based gunfire spotting squadron, which had seen service in the southern France invasion and at Luzon, was extensively used in the bombardment to supplement the more vulnerable battleships and cruiser seaplanes.

At Okinawa the entire book was thrown at the Japs. Enemy air power in and over Formosa, Kyushu and the Ryukyus was kept down not only during the days before the landing but through the entire campaign. Enemy shipping was eliminated and the area isolated from surface reinforcement. Day and night searches and patrols kept air raiders to the minimum. The actual landing was covered with aerial fire-bombing and strafing attacks. Roaming air patrols disrupted enemy efforts to move troops to meet our landing forces. Planes were always on call to support our advancing troops with bombs, fire bombs, rockets, and strafing attacks. Enemy field artillery and mortar positions were incessantly pasted. The battlefield was sprayed with DDT to eliminate the hazard of flies and mosquitoes. Air-supply planes, smoke planes, propaganda drop planes and photo reconnaissance planes were all available to ground commanders—courtesy U. S. Navy!

And the Navy planes kept it up for 50 days. Rear Admiral Durgin, in command of escort carrier forces at Okinawa, disclosed that Navy and Marine airmen from his jeep carriers alone flew more than 35,000 sorties! Those flyers accomplished as many as four missions a day, which meant nine hours of constant fighting in the air.

It is little wonder that carrier pilots went wild with joy when news of the atomic bomb reached them. True, it was an Army *Superfortress* that carried the ball across. But Navy airmen were a part of the team—and during a three-year-long slugging contest over 4,000 miles of ocean, they had backed up the line. END

Altitude and Take-Off

(*Continued from page* 55)

standard atmosphere) that exist at time of flight. All stalling speeds of aircraft are based on *true air speed*. Basically, the stalling speed of any airplane is the lowest speed at which the lift load on the wing is equal to the weight of the airplane. Hence, lift is a function of the *true* rate of air passage over the wings.

Many pilots believe that because of the reduced lift in air of lessened density at airports of higher altitudes, the indicated air speed of the landing glide must be materially increased to avoid a stall. This is erroneous, for with each 1,000-foot increase of altitude above sea level, the true air speed is approximately two per cent greater than the indicated air speed. For instance, if the indicated glide speed of a plane at sea level is 70 m.p.h., at 59° and 29.92 inches of mercury this indicated speed would be identical with true air speed. The indicated glide speed at 5,000 feet could still be 70 m.p.h., but the true air speed would now be 77 m.p.h. The plane's stalling speed at 5,000 feet would be only slightly higher than at sea level and the increase in true air speed would more than compensate for it.

At airports above sea level, however, differences in air density, temperature and pressure create a safety problem in the take-off and rate of climb for the first minute.

Take-off ground run means the acceleration of an airplane from a standing start (zero ground speed) to the minimum air speed at which flight becomes possible and safe. The acceleration-producing force equals the difference between thrust, exerted by the propeller, and resistance, or drag, created by the moving plane. Thrust results from the power drawn from the engine and is, at a given air speed and density, approximately that of the engine's rated power.

Resistance to motion comprises the rolling resistance of the landing-gear wheels and the air drag of the plane itself. The minimum speed which must be attained is that at which the airplane's lift, dependent upon the plane's attitude, will equal the gross weight of the plane and its load.

Thus, take-off distance, speed and accelerating force are inter-related. For a given force, the take-off distance is approximately proportional to the square of the speed—if the speed is increased 20 per cent, the distance is increased approximately 44 per cent. Axiomatically, for a given speed the take-off distance required is inversely proportional to the force, and if the force is doubled, the distance is halved.

At the end of a take-off run, the lift load on an airplane must equal its gross weight no matter what combination of airspeed and air density is involved. If at one time the density, or weight of the air, is less than at another, the take-off speed must be greater in order that the rule of "density times the square of the airspeed and resultant lift" remain constant. And the take-off ground run will tend to increase in proportion to the decrease in surrounding air density.

To translate this physical condition into flight data, one must know the wing loading and power loading of his airplane. Wing loading is the gross weight of the airplane divided by the total wing area; power loading is the airplane's gross weight divided by the available engine horsepower, with both equations being expressed in pounds. Let's consider the case of a Piper *Cub* with a 65-h.p. engine, typical of many lightplanes.

Based on a total gross weight of 1,220 pounds, the *Cub* will have a wing loading of 6.83 pounds per square foot of wing. For table reference, it can be considered seven pounds. The power loading is 18.8 pounds per horsepower.

Referring these figures to the accompanying CAA chart (page 55), note that the wing loading and power loading divisions are shown horizontally, and temperature and altitude vertically. To put the chart to work, let us assume that we make a cross-country trip in the *Cub*, taking off from our home airport with a 1,000-foot elevation and intend to land and later take off from an airport with a 5,000-foot elevation.

Using the figures grouped under five-pound wing loading and 20-pound power loading, we find that at our home airport, with a temperature of 60°, we would need slightly in excess of 368 feet for our take-off run. The rate of climb for the first minute after take-off under these conditions would be slightly more than 698 f.p.m. And factors in this case create a stalling speed of 40 m.p.h.

But when we have reached the 5,000-foot elevation airport, the differences in air density cause these values to change. Assume the thermometer here also reads 60°. But our chart tells us that we now would require in excess of 581 feet for our take-off run, the first minute rate of climb would now be only a little more than 514 f.p.m., and our plane's stalling speed would be 43 m.p.h. true air speed.

This information could be vital if the airport had obstacles in the flight path or if rises in the ground ahead of the take-off were such that there was some question of clearing them. Those pilots who, at a glance, would dismiss such a situation with the statement—"I've cleared areas at home just about that far away," might tally a sad score on their guesswork.

For pilots flying heavier aircraft, one

might use as an example a Beechcraft Model D-17 with a 450-h.p. *Wasp* engine. This airplane weighs 4,250 pounds gross, has a wing loading of 14.3 pounds per square foot and a power loading of 9.45 pounds per unit of horsepower. Let's assume our home airport is approximately at sea level and the temperature there is 40°. The proper chart columns for the table (page 55) in this instance would be those for a 15-pound wing loading and a 10-pound power loading. Under these conditions we would require a take-off ground run of 620 feet, our first minute rate of climb would be 1,706 f.p.m. and our stalling speed, 63 m.p.h.

After a cross-country flight to Colorado, we take off from an airport at 6,000 feet elevation and a temperature of 20°. This time our table tells us that we now will require 1,073 feet for a take-off run, that our rate of climb for that first minute will be only 1,215 f.p.m., and that the plane will stall out at 69 m.p.h. true air speed.

This clearly points out that altitude and temperature have a definite effect on the performance of aircraft. In the latter case, unless a transient pilot were aware of the need for an additional 450 feet for take-off, he could easily endanger his life, the lives of any passengers, and the airplane. Since the rate of climb during the first minute would be reduced almost 500 feet and the stalling speed increased six m.p.h., the pilot would have to compensate for these decreased values by establishing a different angle of climb and an increased air speed over that normally held in the take-off climb.

Manufacturers of airspeed indicators are held by CAA regulation to an accuracy of not more than plus-or-minus five m.p.h. (at top speed in level flight at sea level) in their product. While, at present, no CAA ruling applies to the manufacture of altimeters, producers of this instrument set up tolerances of their own that reflect appreciable accuracy.

Sensitive altimeters are held within a 20-foot error at 1,000 feet, a 100-foot error at 10,000 feet and an error of 150 feet or less at 20,000 feet. Altimeters that indicate only 200-foot graduations are held to a 50-foot error at 1,000 feet and not more than a 200-foot error at 10,000 feet.

Pilots should have their altimeters and air speed indicators checked periodically and, when found necessary, calibrated by reliable instrument mechanics. This will eliminate any possible danger which might result from the use of inaccurate instruments.

With this information, the performance of aircraft at various altitude and temperature combinations may easily be determined by referring to the table, as has been illustrated, after the wing and power loading factors are established. Every plane owner should be aware of these values and how they affect the performance of his particular airplane. This knowledge should be supplemented by an understanding of the altimeter and airspeed indicator that is compatible with the common-sense rules of safety. Instruments will perform their duties within certain limits—it rests with the pilot to *know* these limits. END

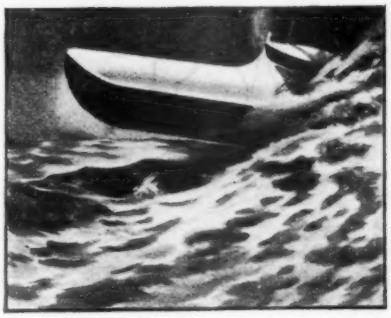
Advertisement

EVERY LAKE AN AIRPORT

Plethora of Landing Spots

Some day, there may be an airstrip every few hundred miles around the world. How long that will be nobody knows—but authorities agree it will take at least a few generations. Construction of airports, even in the United States, is lagging way behind the potential uses of the flying machine.

Self-evident, therefore, is the vast utility of the amphibion—which can land and take off on both firm ground and water. For there are tens of thousands of water "bases," within a few hundred miles or less of each other, all over the world. Safe it is to say that any amphibion with a thousand-mile range or more can get to and from any spot on this globe without benefit of airports.



Problem of Troubled Waters

There is a considerable "backbone" in waves when they are hit hard. An airplane needs speed to take off, and reasonably fast forward motion to land without damage. Primary problem of day-in and day-out use of amphibions, therefore, is the ability to take waves.

Weight and strength are inseparable. Since an amphibion hull must be big enough to float the plane, it represents a big load—all the more so, when that hull has to be strong enough to slap sizeable waves out of its way.

To build a practical amphibion, you must be both an airplane and a speedboat engineer. And if you want load capacity and range after allowing for a strong, seaworthy hull you have to be good at both kinds of engineering.

Amphibious Transport

Engineers and aircraft workers at Columbia's Valley Stream plant proved

their ability to build a rugged amphibion which could go places and do things which other planes could not. Columbia "Ducks" performed notable war service throughout the far-flung fronts of the amphibious war, and from cruisers and carrier decks as well. Their ability to "take it" became legendary.

Now Columbia workers are putting the finishing touches on a new and larger amphibion, with greatly increased load and range. More impressive in size, streamlined appearance and performance than the "beloved Duck," the new plane has all the ruggedness and reliability of its predecessor. Details of its extraordinary capabilities are available on request. They will have interest for all who trade or transport to out-of-the-way places and seek speed without benefit of airports.

Columbia Aircraft Corporation, Valley Stream, New York.

Report from Washington

(*Continued from page 43*)

up to date every two weeks. Aubry won his point plus the congratulations of Administrator T. P. Wright and Ben Stern, Assistant Administrator for Aviation Information and Aubry's immediate boss. Aubry is now planning other economies.

Military Stuff

Lockheed Aircraft Company soon will attempt to set a Burbank-New York speed record with three *Shooting Stars*. Two of them are scheduled to make fueling stops, but the third, a veritable flying fuel cell, will try a non-stop trip. With favorable tail winds, the existing official record of 5 hr. 27 min., held by the *Superfortress*, may be bettered.

Meanwhile, Douglas Aircraft Company will sit back waiting for the P-80 attempt and then will try another transcontinental dash—this time with their XB-42A. The 42A differs from the XB-42, which recently set an unofficial transcontinental record, in that it has two jet units, one under each wing, in addition to the two Allison liquid-cooled engines which supply power to the coaxial tail props.

Douglas also soon will complete the XB-43, similar in appearance and design to the XB-42 but equipped with two 5,000-h.p. gas turbines. It probably will fly in mid-1946.

NATS at Pearl Harbor has a unique 14-unit Link trainer set-up. Pilots are required to file a flight plan, check weather and do all actual radio work with a simulated tower and airway traffic control office in the same building. Facilities permit handling as many as six to eight Link pilots, all coming into the same airport—Oakland, for example. Traffic control must give the pilots altitudes and check constantly on their progress. It is then up to the tower to get them all down safely. Everything simulates actual flight conditions. Most Link trainer work merely enables pilots to fly the stipulated instrument hours.

The Moseley Plan

The RFC's latest move to dispose of surplus basic training planes for $975 each, with a 20 per cent discount to buyers of three or more, has the wholehearted support of at least one operator, Maj. C. C. Moseley of the Glendale (Calif.) Airport, who looks at it this way:

"The Government trend toward scrapping aircraft that cannot be sold at present established prices is absolutely wrong and must be stopped. These types include C-45s, C-46s, C-47s, C-60s, C-78s, BT-13s, AT-6s and all trainers. Agencies which have been delegated surplus disposal are doing a good job under the circumstances but the problem has not been approached properly.

"A glaring example is the BT-13, placed on the market in large quantities many months ago at a price of $3,800. Only 100 were sold up to December. The price now has been wisely dropped and they can be purchased in quantities of three or more at a price of $690 each.

"Every one of these planes can be sold if the following suggested program is followed: reduce the price 10 per cent every month until the last airplane is sold—even if it is for only one dollar. There is a market for every surplus airplane at a price. Non-flying ships are very valuable for spares."

Lightplane Production

Aircraft Industries Association reports that production of personal aircraft will exceed 30,000 units in 1946 (a rosy estimate). But production at even that level will fall far short of filling the orders on hand which, a few days before Christmas, was about 50,000. In 1941, the 25,000 planes in existence represented total production of the preceding six years. Peak peacetime production (1941) was 6,597 personal planes. The AIA forecast of 1946 production in dollars ranges from $600,000,000 to $750,000,000, comprising about $500,000,000 in military orders, $125,000,000 in commercial transports and $100,000,000 in personal aircraft.

Aircraft Shows

The AIA will sponsor two national aircraft shows in 1946, one each in the east and west. Both will be held sometime in the fall and will be patterned after the pre-war national automobile shows. While AIA will not participate in the various aircraft exhibits now being planned by communities across the country, it is prepared to offer guidance to those cities which can induce distributors or dealers to co-operate. Chief obstacle to shows before the fall of this year, as Ernest R. Breech (AIA's air show committee chairman) announced, is that manufacturers are too busy filling large backlogs of orders and can't spare time or personnel for shows.

Air Forces Association

Willis B. Fitch, former colonel in the AAF cadet training program, is executive director of the Air Forces Association, a new organization chartered in New York state for the announced purpose of preserving and fostering "the spirit of fellowship among former members of the AAF, and to provide an organization through which its members may unite in fraternal bonds of comradeship." But it will be more than that, since one of the primary objectives of AFA is a separate air force. C. R. Smith, chairman of the board of American Airlines, is a director. Membership is open to AAF veterans of World Wars I and II and is not restricted to flyers; anyone who was part of the AAF or of a ground group associated with it in any way is eligible. AFA headquarters is at 1603 K Street, N. W., Washington, D. C.

Halsey Memoirs

Colorful Admiral Halsey soon will begin assembling material for his memoirs, aided by Lieut. Comdr. J. Bryan III, former associate editor of *Saturday Evening Post* and one of the Navy's top aviation public relations men during the war. Lieutenant Commander Bryan soon will leave the Navy and will join Admiral Halsey in Florida. END

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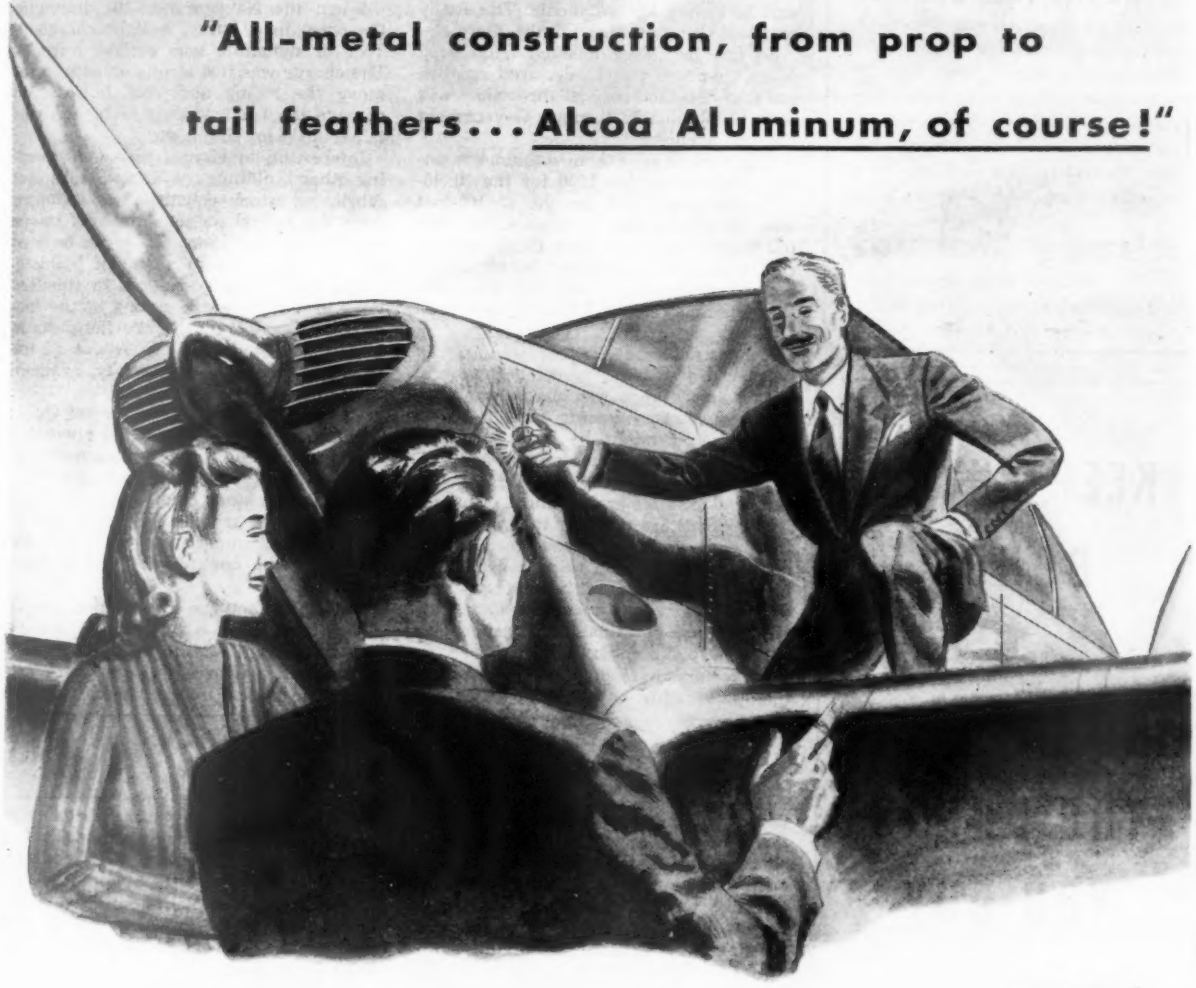

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Quonsets for Airports

(*Continued from page 49*)

gether solved the administration building problem for Terre Haute. With larger huts, the airport could have additional hangar space or warehousing for freight.

Great Lakes Steel Corporation's Stran-Steel division offers Quonsets in three sizes for hangars, providing arched roof construction with floor space unobstructed by supporting pillars or overhead cross beams.

Smallest of the three sizes is 20x48 feet, the next 40x100 feet and the largest 102x100 feet with 10,200 square feet of floor area. Any of the three sizes can be made shorter or longer by using fewer or more arch sections.

All Quonsets built for war use were supplied to the Navy. Many, doubtless, have been destroyed while others may still be crated for shipment. The Army obtained Quonsets through the Navy.

So far, the Navy has not announced when Quonsets will be declared surplus, but it is expected that all three sizes will soon be obtainable through Government disposal agencies.

Prices for complete, new Quonsets under construction are $900 for the 20x40-foot size and $3,000 for the 40x100-foot size. Buildings can be made taller than the arched sections since these sections can be placed on a higher foundation or a vertical section of standard construction units may be used for the lower wall portion.

Hangar doors can be any size and may be placed anywhere, by using horizontal beams across open sections where additional support is needed. Thus a 20x40-foot Quonset might be used for lightplanes by placing large doors in one side.

Laying out Quonsets is comparatively simple since sizes are standard. Channel iron sections are used for the base of the framework and are fastened to the foundation, much as with wood construction, by embedding bolts in the concrete foundation. Variations from standard construction are not difficult. Erection does not require skilled workers.

Airports requiring more hangar space than provided by the largest Quonset can combine building units by placing them side-by-side to obtain any amount of floor space with supports only between the arched sections.

While the covering furnished with the units is standard, any type of covering may be used both inside and out. Metal, wood, wallboard or any suitable material is satisfactory where inside wall covering is desired.

The all-steel construction of the Quonset framework makes it adaptable for either permanent or temporary installations. Used as a temporary building, doubled-headed scaffold nails are used to make pulling easier. The covering may be taken off and the building completely dismantled without damaging the framework.

When the Navy wanted to dismantle Quonsets in a hurry, a light charge of TNT or dynamite was exploded inside. The charge was just strong enough to remove the siding and roof but not to damage the framework, which then was taken apart for shipment.

Interesting to airport managers needing other buildings are Stran-Steel's prefabricated steel constructions, adapted from the arched sections and roof beams used in Quonset huts. They can be used for any type, size or shape of building. These units, which are sold in standard sizes or cut to specifications at the factory, go together much like the parts in childrens' "Erector" sets. About all the builder needs is a screwdriver, hammer, nails and saw.

Construction with prefabricated Quonset units is ideal for the builder working without a trained crew, as sections can be assembled flat on the ground, then raised into position and fastened. If the foundation is straight and level and "I" beams and channels the right length, the building will be automatically perpendicular.

One manufacturer who needed a small Quonset put up in a hurry couldn't find a contractor with time to do the job. Two of his truck drivers went to work and had it up in less than a week. END

Is Private Flying Oversold?

(*Continued from page 22*)

negotiated leases which do not require them to pay even their proportionate share of the cost and the non-scheduled operators have been charged high rates to make up the difference. Thus if an airport is located inaccessibly solely so that it may later accommodate an airline or feeder line stop, it would seem that the private pilot is asked not only to put up with an inferior service but to pay more for that service than he would have to pay for a service suitable to his needs.

We could construct airports suitable for those who are now ready and willing to pay for their upkeep. Later, if it is desired to provide for a feeder line operation, and if such operations then do require longer runways, a second airport could be constructed to accommodate this service and any other service that desired to use it. If these services cannot support the second airport, it should be subsidized by the community. Private flyers should not be forced to subsidize it by the expedient of closing the field they have been using.

In the matter of airport site selections we still seem to be doing a better job of building up than of breaking down opposition to the location of airports convenient to the users. Unnecessarily low flying over dwellings seems to be on the increase rather than on the decrease despite pleas that it be discontinued. The attitude of many pilots continues to be:

"Nuts to him. He can't do anything to

me . . . the air is free. If he doesn't like my flying let him move somewhere else."

It is too bad that these pilots cannot be placed in the position of attempting to get approval of the establishment of airports near residential sections. Perhaps then they would realize what their attitude and flying has done to make it difficult to secure what these pilots want—close-in airports.

Not a few of these pilots are in the military services or have just recently left them. When the war was on the citizens put up with this flying as a patriotic gesture or because they could do nothing about it. The war is over now and pilots can do something about winning civilian good-will. I wonder if Army-Navy boys ever stop to think that their flying with complete indifference to the citizen on the ground is making it more difficult for some of their buddies to get themselves set up in an aviation enterprise.

We could do much toward breaking down opposition to the establishment of airports where we would like to have them by simply being a little more considerate of our earthbound brothers when we are airborne.

The manufacturers apparently are not making any determined effort to aid in eliminating the runway handicap. In general the post-war airplane is going to require runways just as long as the pre-war airplane—in many cases longer. Stalling speeds have gone up, not down, to secure higher top speeds or greater pay loads despite the effect of stall speeds on runway lengths. A survey of pre-war dissatisfied customers showed they believed that too much attention had been given to high speeds and too little to low speeds, a reaction that was confirmed later in a meeting of distributors of one popular lightplane.

Furthermore, the post-war personal airplanes, for the most part, are going to require all-way fields to the same extent that pre-war planes did, for only in the hands of very skilled pilots can they be landed safely in high velocity cross winds. When we are talking about 400,000 personal airplanes we cannot be talking of 400,000 skilled pilots to fly them. The tricycle undercarriage, which is a partial answer to the problem of cross-wind landings, was available to all and its advantages were well proved in the military services. However, many of the post-war airplanes will not be so equipped. And there are distinct possibilities that even better undercarriages could be developed without too much effort.

The CAA has funds to assist such developments and, not wishing to embark on experimental work with its own personnel, is endeavoring to place contracts with the manufacturers to carry on the work. We feel that in their own interest manufacturers should devote time to determining whether the product which they will offer could be modified to permit it to operate from one-way fields. We are not sure that it can be. But we are also sure that manufacturers do not know that it can not be. In view of the importance of making fields more accessible without making them prohibitively costly, it does seem good business to attempt to find this out as quickly as possible.

The manufacturers could also contribute greatly to the solution of the noise problem, and some of them are. But many seem to feel that this is something which can be put off to some future date. Of course a reduction in noise will be welcome even then but it can then have no effect upon the location of the many airports whose sites will be selected in 1946. Action now would be helpful in securing better locations more promptly.

In addition to the problem of accessibility of airports, there is another airport problem whose solution does not seem to be making much progress. I refer to the manner in which airports and the services thereon are now conducted.

Dirty airports and poor service seem to be no less prevalent now than they were before the war. There continues to be an attitude of tolerance toward would-be customers on the part of airport personnel. In the sellers' market of the immediate future there is danger that this condition may become worse rather than better and everyone concerned with the long-range future of personal flying should do all in his power to correct this condition. Communities constructing airports should give this matter serious consideration when selecting airport managers or granting operators' licenses.

There appears to be almost a code of ethics among instructors requiring them

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to humble the would-be flyer. If our objective were to make the flying fraternity exclusive, that attitude would be understandable. However, such an attitude is inconsistent with the objective of making personal flying popular and should be eliminated as rapidly as possible. If it is not, our post-war record may not be much better than our pre-war record when we discouraged 85 per cent of all those seeking flying instruction. Operators would do well to make an appraisal of their instructors and to weed out those who insist upon acting as though they were doing a great favor for their students in allowing them to take the instruction for which they are paying.

Instruction must be made only incidental to flying or we cannot have anything approaching a mass market. Automobiles, radios and washing machines are not purchased for the purpose of learning how to use them—they are purchased to provide a service after the owner has learned how to use them. Instructional driving constitutes less than one-half of one per cent of all automobile driving. In contrast, instructional flying has varied up to over 50 per cent of all non-scheduled flying. The emphasis which has been placed on flight instruction in the past must be shifted to emphasis on cross-country flying if the airplane is to have utility. Cross-country flying was generally discouraged prior to the war by renters of airplanes.

The most promising post-war activity that I know of will be the "Fly-Yourself" services which will permit rental of an airplane in one city and turning it in at another. Many pilots will not have a sufficiently strong desire to fly to be satisfied with fooling around an airport. But they would, if they could combine their flying with trips they might otherwise make by some other means of transportation. Such a fly-yourself service would secure a high factor of equipment utilization and should be able to bring costs down to where there would be little, if any, increase in the expense in making the same trip by either rail or airline.

Lack of utility of the personal airplane was a large factor in limiting sales before the war. Although more numerous and more accessibly located airports will add greatly to the utility of the personal airplane, there are other things which could be done to increase utility still further but are not being done at the present time on a scale commensurate with their importance.

One is making the airplane roadable. Although some manufacturers announced their intentions of carrying on such developments some time ago, they now appear to have abandoned them. There is no question in my mind as to the possibility of developing a roadable airplane having reasonably good performance. There will be problems to solve in such a development, but by solving problems we make progress.

The roadable airplane is a partial answer to weather interruptions. It would permit starting on a trip in the face of threatening weather and the time lost would only be that due to the difference between road and air speed. It would not be measured, as now, by the duration of the bad weather.

The roadable airplane would permit starting from home and continuing on to the final destination. It would minimize the adverse effects of inaccessible airports, and it would be a more satisfactory substitute for the second car in a two-car family than would a non-roadable type, as the remaining car would not be required for transportation to and from the airport.

Arguments that the non-roadable airplane will always out-perform the roadable airplane in the air and that the automobile will always out-perform it on the ground are, to my mind, completely irrelevant. If the owner had the option of carrying an automobile with him which he could place inside the airplane, such an argument might stand up. But he does not have such a choice. If his airplane is not roadable and he is forced down by weather, the best car in the world, parked several hundred miles away at home in the garage, would not do him much good.

The fear expressed by some that the roadable airplane would be damaged on the highway overlooks the extent to which non-roadable airplanes are damaged on the airports. It is not at all impossible that the very features that would make the airplane roadable would also materially decrease accidents on the airports. Studies by the AAF Office of Flying Safety have shown that such accidents comprise a very substantial proportion of all accidents. They found that even such a small change as substituting the tricycle undercarriage for the conventional undercarriage greatly reduced ground accidents as an airplane in normal flight position provides better vision and better ground control. [See FLYING, February, 1945, page 24.]

Ability to fly slowly also would aid in solving weather problems in addition to contributing other advantages. There is a direct relationship between visibility requirements for safe flight and flight speed. One mile visibility provides about the same degree of safety for a plane flying at 60 m.p.h. as two miles visibility provides for a plane flying at 120 m.p.h. If one mile visibility is satisfactory for 60 m.p.h., one-half mile visibility would be all that is required if 30 m.p.h. were possible.

Generally speaking, all the public knows about the helicopter is that it can go slowly, stand still, and land on a rooftop. This is sufficient to convince thousands with no interest in airplanes that they want a helicopter despite the fact that they know that it cannot compete with the airplane in speed. Present indications are that the public will not get the helicopter for a few years due to high cost and maintenance problems. But, it could be offered an airplane that would closely approximate helicopter performance, including rooftop landings. It is even possible that an airplane will be developed to stand still in the air so long as power is available.

There is no fundamental law of aerodynamics which precludes the attainment of low speeds with present wing loadings and power loadings. The engines now used in our small planes provide sufficient power for speeds as low as 15 m.p.h. without increased wing areas. But the attainment of low speeds does require development work which does not now appear to be under way or contemplated by the manufacturers of personal planes.

Summing up, personal flying could be developed into a business of $1,000,000,000 a year. A tremendous public interest in flying has been built up during the war. All surveys indicate this. But this interest was not built up by those in the personal flying industry nor is it the result of the use of personal airplanes prior to the war. It was built up by the records of war-time flying and there is no reason to believe that these would-be customers will be any less exacting or any easier to please than were their brothers before the war. Their brothers were not satisfied and we appear to have little intention of correcting those same bad practices which led to their dissatisfaction.

Unless we do correct them before the mass of these customers taste our wares, we shall lose the greatest opportunity we have ever had to make personal flying an accepted part of the everyday life of a U. S. citizen. END

EVEREST EPISODE

A *Mosquito* and a *Spitfire* out on a routine reconnaissance flight over the rugged Himalayan mountains were forced to alter their course when they ran into heavy storm clouds.

Climbing to break through the clouds, the pilots got a glimpse of the highest mountain in the world, Mr. Everest, glistening within 3,000 yards. They held their 32,000 foot altitude and flew directly toward the 29,141 foot peak as the *Spitfire* pilot recorded the flight with this photograph of the *Mosquito*.

Pilots reported that the outside temperature was 17° below zero. There were no icing conditions.

Fog Cutter

(Continued from page 25)

absorb and retain water (called hygroscopic agents) such as calcium chloride, the chemical used to keep basements dry, may be used in the *Nofog* process. This agent is condensed and held (technically "vaporized and adsorbed") by carbon particles, which are finely dispersed in an open furnace at approximately 1,600°, with formation of the carbon particles. Vaporization and adsorption takes place in one operation. Practically any liquid or gaseous hydrocarbon such as a petroleum product may be utilized as a source for the carbon. The furnace, or mixer, is simple in design. Early experimental production took place in a molasses pot. A forced overhead draft is the most rigid requirement.

For ground operation, the raw materials are mixed and heated on the scene. The resultant fine powder, resembling lampblack, is started upward by the furnace heat and gathers its own power as it goes along. This slow-rising convection current acts like a blotter and absorbs the moisture or fog in the air. It appears to be independent of drafts or other air currents over the experimental area. Inadequate meteorological checks have prevented those working with *Nofog* from accurately measuring the maximum effective altitude of this current. On several occasions, however, they have brought out the sun. Impartial observers have noted 800-foot domes in heavy fog banks brought about through the use of *Nofog*.

For cutting holes in fog from an airplane, the prepared powder is weighted slightly to make it settle. The pilot releases a quantity through a chute or similar device. After circling the field for a while he is rewarded with a glimpse of the ground. The Nofog hole will last long enough for him to bring the plane down through straight contact flying.

Officials of the company expect to concentrate on fog prevention. Meterological instruments will be connected to the generators in such a way that as soon as fogging conditions start, particles of *Nofog* will be released automatically. When the atmosphere is clear again the action will stop automatically. They also envisage various types of release mechanisms for airplanes, ships or even automotive vehicles. There would be no particular problem in fixing up rockets or other projectiles for the purpose of clearing fog ahead or to the side of the operator, they say.

The significant difference between this and other fog dispersal devices is that the product itself has a continuous dissipation effect as it progresses through the atmosphere, instead of depending on the effective area of heat or chemical reaction from a fixed source. Engineers and chemists connected with the development explain that the material simply puts latent natural forces to work in a sort of chain reaction.

A. R. Archibald, mining engineer, chemist and president of the newly formed Aero Safety Appliance Corp.

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which has contracted for the distribution and sale of *Nofog* in 10 eastern states, puts it this way:

"Water vapor is adsorbed by the carbon. Latent heat of the vapor is taken up as sensible heat by the carbon simultaneously with absorption and condensation of water from the vapor by the hygroscopic agent. Water reacting with carbon and the hygroscopic agent causes ionization of the particles of the product which repel each other over an exceptionally wide area, exposing the surface of each to the maximum and resulting in repeating and increasing reactions. Meanwhile, the surface tension of the condensed water is so increased by the hygroscopic agent that instead of being revaporized, using up the sensible heat in this way, the heat is taken up by the carbon to produce an upward radiation carrying the air and vapor with it. The sensible heat again becomes latent heat as the vapor is forced to expand in compliance with the adiabatic rule (The rate at which ascending air cools, or descending air warms, when no heat is added or taken away.) This reduces the relative humidity and, to some extent, causes condensation by expansion. The condensate is picked up by the largest drops formed on the particles of the product and is swept away by the moving current of air. Some of the drops become so heavy they fall to the ground."

A further explanation offered is that the de-ionization of the air or moisture particles by reaction with the gases of combusion lowers the dew point. Others confess frankly they don't know how it works. Whatever the explanation, those working with *Nofog* say that all experiments result in the disappearance of condensed water vapor. No toxic effects to plant or animal life have been observed.

Discovery of the formula goes back to the early '30's when Pleasants was puttering around with chemicals in an attempt to make a substitute for gasoline. Mrs. Pleasants noticed that the closet where he hung his dirty working clothes, although it had been very damp, was now dry as a bone. On foggy days she also noticed that there was clear sky above their house on Twin Peaks. She insisted that there was a connection between these events and her husband's experiments. More to prove her wrong than for any other reason, Pleasants relates, he took her one night to a cut where a large pocket of fog had gathered, and dumped a potful of his chemicals over the side. The fog slowly disappeared. After he had tried this experiment several more times, he conceded that Mrs. Pleasants was right.

Then followed a disappointing series of visits to airports and businessmen in an effort to get somebody to try out his fog destroyer. In 1936, he approached E. H. Dimity, scientific advisor to the late Amelia Earhart. Dimity was interested. He hired William A. Ward, a transport pilot, to take Pleasants on a flight. It was made from Alameda with 50 pounds of chemicals. There was a 500-foot ceiling with heavy fog above. After circling upward in the fog for a time, Ward told Pleasants to let go with his bucket. A big hole opened up, and Ward dived through it for a safe landing. This was the convincer for Dimity, who from then on saw to it that funds and equipment were made available.

A corporation was formed with Dimity as president. Roscoe Turner became vice-president and Paul Mantz took a post on the technical board. A laboratory was established at Alameda and the crude process was refined and improved upon. First experiments utilized gasoline along with the still-secret formula. In September, 1936, field tests were run for three months at Lime Point on the north shore of Golden Gate with this combination. Government observers made a detailed report after completion of the tests. The fog was permitted to roll in until a zero-zero condition existed and would then be pushed back to the extent that shipping could move in the channel without foghorns. During operations of the *Nofog* generator, the ceiling maintained was at no time less than 500 feet, it is claimed. Crews were on hand 24 hours a day.

J. D. Ballard, an engineer for the Golden Gate Bridge then under construction, was so impressed that he wrote a letter to the corporation affirming that in his opinion the only explanation for the fog-clearing phenomena he had witnessed on his way to and from work was that the machines were causing them.

Miss Earhart had such faith in the properties of Pleasants' process that some of the powder was placed aboard her plane for emergencies in her attempted world flight in 1937.

In November, 1938, Maj. William H. Fillmore's chief pilot, using a Stearman biplane (NC 8806) made a test with O. L. Notley aboard, clearing a hole in dense fog over San Francisco Bay of sufficient size to make a landing. Affidavits are on file to verify this test.

George McDonald, the bomber doctor, made a test flight with Ward from Alameda. They flew over heavy fog which was dispersed with *Nofog* sufficiently to permit landing through the holes. Convinced of the benefits in what they had witnessed they, too, filed affidavits.

From 1937 to 1939 there were several inquiries from British officials seeking authentic reports on the tests and full details on the process. At that time the U. S. Government considered its reports of the Golden Gate tests secret and the corporation had not yet secured patent protection and was unwilling to risk losing its control over the invention. After extensive research and development, U. S. patents were issued in February, 1941, and protection was obtained later in 10 foreign countries, including England. By this time Pleasants had found that materials much cheaper than gasoline could be used.

The Nazis and the Nips were interested too. Before the war, agents of each of the enemy powers tried to negotiate for rights to the invention, it is said. A German saboteur landed by submarine said after his capture that one of his objectives was the *Nofog* formula. Although patented in Japan and available to Germany through a French patent, there is no evidence that either country ever did anything with the idea.

When war was declared Pleasants and Dimity immediately tried to interest the War and Navy Departments in their process. Repeated petitions for a chance to show the merits of the invention resulted each time in a suggestion to submit details to the Inventor's Council, Dimity states. Having worked for years to develop and prove their product the men said they were not interested in letting the Government take it over and pigeonhole it. Late in the war the Army agreed to witness a demonstration at Sacramento provided the company furnished plane, pilot and equipment, and payed all expenses. The firm was willing to take this responsibility but the CAA did not clear the flight until the fog season was over.

Interest was again aroused in the project just recently. Pleasants and a crew had been running a series of experiments for several weeks on the south shore of Golden Gate below Lincoln Park. Since the area was under Army control, the Western Defense Command had given permission for its use. Last October, several curious persons called the San Francisco *Chronicle*, asking about a strange phenomenon. The newspaper decided to investigate. An airman, Lieut. Robert L. Gassoway, AAF, was also attracted. Gassoway saw three different fog clearings in one day from the hills above the beach—and came away sold on the practicability of the process. The newspaper reporter and photographer saw and photographed the fog being cleared.

The Navy was planning a big demonstration of FIDO at Eureka later that

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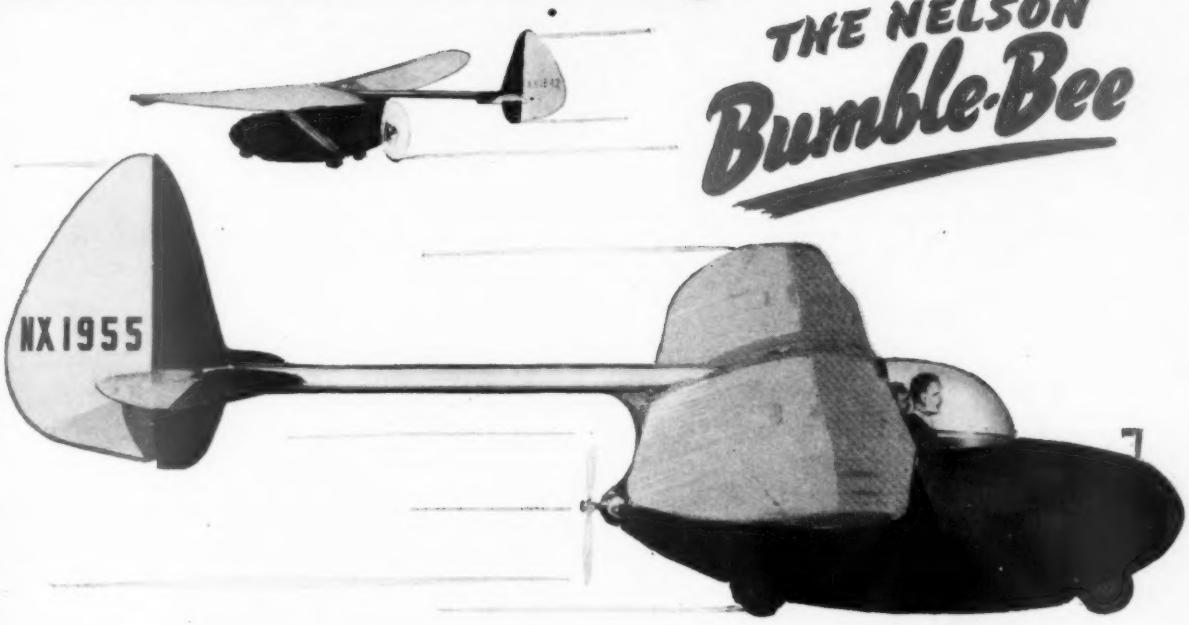

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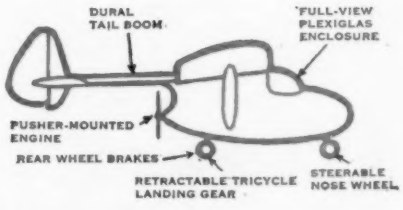

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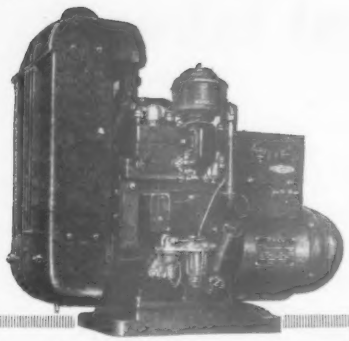

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month. San Francisco city fathers, long plagued by fog problems, were to be special guests. British observers were in San Francisco for the event. The quiet little affair at Lincoln Park proved more interesting and the Eureka demonstration was indefinitely postponed.

Dimity says that the preliminaries are over. He is planning a full scale three months' test at the foggiest airport he can find. Twenty-four hour weather reports will be correlated with results of the experiments. There will be accurate measurements of fog thicknesses, dew points and other data. Also planned is a special flight with aerial release of *Nofog* to be recorded by a camera plane.

This information will enable the corporation to get started in production and distribution. Since October 15 there have already been offers to buy it as is, and a large variety of other propositions. There are many applications besides those to aviation and the transportation industry. Producers of outdoor sporting events would like visibility insurance. The motion picture industry is particularly interested. Because of the relation of dew point to frost, growers of many agricultural products are anxious to know more. One city has written a request for immediate delivery of several units so it can call itself "America's first weather-conditioned city."

If anyone should ask you if you want a fog-disperser, don't give him a raised eyebrow. He may be one of the company's salesmen. END

Canada's Flying Clubs

(*Continued from page 45*)

Now that the war is over the clubs feel that they need a stronger association to handle mutual problems and to take care of the expected increase in private flying. These problems include private flying regulations, requirements for private pilot licenses, airport regulations, customs tariffs on aircraft and equipment not made in Canada, and international private flying traffic.

The association has hired a secretary-manager, Group Captain Gordon Welstead, recently discharged from the RCAF. He will have his headquarters at Ottawa and for his use and that of other executives of the association, a twin-engined Cessna *Crane*, has been purchased from WAC so that the association's executives can quickly visit flying clubs all over Canada whenever necessary.

The association will distribute De Havilland *Tiger Moths* and other aircraft it has to clubs on a basis of population of the center where the club is located. A, B and C categories have been established for cities up to 50,000 population, 100,000 population and over that number. The distribution ratio will be roughly six, eight and 11 planes per club for the various classes. Clubs will be able to purchase additional planes in the open market when necessary.

The clubs have not yet made definite plans as to what light aircraft they intend to purchase. They feel that the *Tiger Moths* and other surplus aircraft they are buying should last for at least two years, by which time production of lightplanes will be sufficient.

Canadian clubs and private flyers have the problem of paying more for their lightplanes than do American private pilots. Customs duty on aircraft is about 35 per cent of the selling price in the United States. On top of this are additional taxes, such as the eight per cent sales tax and, at present, a 10 per cent differential on U. S. dollars. All this makes the aircraft much more expensive and operating costs higher in Canada than in the U. S. One of the problems the association will have to solve is that of customs duty, as few lightplanes are made in Canada, and customs tariffs are primarily established to protect a local industry.

In Canada, Fleet made a small plane before the war, as did De Havilland and Cub Aircraft, all in southern Ontario. These three firms have announced their intended post-war lightplane production. All other lightplanes for private or club flyers were imported from the United States and already dealers have franchises on a number of well-known American post-war lightplanes. Another problem for the association will be to have more of these made in Canada, or at least assembled in Canada to overcome tariffs, or to persuade Ottawa to lower tariffs considerably. Canadian clubs want modern lightplanes using tricycle landing gear, and modern seaplanes because of the many lakes in the resort areas of northern Canada where club members will want to fly their own planes for summer vacations.

The association does not contemplate setting Dominion-wide standardized rates for club activities. Undoubtedly these will be compared by the various clubs and savings instituted through a pooling of information on operational economies. Flying clubs before the war operated in a variety of ways, some as society country clubs with limited membership, others with membership open to anyone interested in flying lightplanes. Post-war flying clubs do not plan to be society country clubs but have membership available to all interested in flying. Before the war the 21 clubs then in existence had approximately 1,500 members across Canada. With many more people having learned to fly, membership is expected to soar. Since the clubs are not yet active, it is difficult to estimate what the total 1946 membership will be.

All clubs expect again to give flying instruction for various grades of pilots, provide maintenance service at their field, hangar accommodation for club planes and those of members and renting of their aircraft to members. Rates of instruction vary throughout the Dominion, but average $10 an hour for dual instruction in *Tiger Moths* and $8 an hour for solo. The average pupil requires about 20 to 25 hours in the air to qualify for his private pilot's license.

Before the war some clubs shared fields with commercial operators and schools,

others had their own fields. With the RCAF having taken over many of these fields and airplane war factories having expanded over some of the club's fields, a number of clubs now are looking for new sites. A number of RCAF school fields which are no longer needed are already being used by some of the clubs.

Before the war insurance for flying clubs was hard to get since the fields and planes usually were not of the best. With fields better developed and more people flying as a result of the war, flying club insurance is now easier to obtain in Canada.

Typical of the insurance which Canadian flying clubs now plan to carry is that of the revived Ontario County Flying Club at Oshawa, Ont. This club carries protection on the physical assets of the club, including planes; protection of the club against suit for damage to property of the public or to persons of the public, and protection for club members and employees in case of accident.

Physical assets such as buildings, furnishings, spare parts, machinery, etc., are covered by fire insurance. Planes have full insurance covering risk of fire, transportation when not in flight, windstorm when not in flight, theft and land damage caused by collision with other than club-owned planes. The policy is effective except when a plane is airborne or just completing a landing. The club carries crash insurance at prevailing insurance rates on its planes separately.

Each club-owned aircraft is insured for $10,000 for injury to one person, $20,000 for two or more persons injured in one accident. Property damage liability carried is $10,000 per plane. In addition to this the Oshawa club purchased passenger liability insurance which protects the club from suit by a passenger or his estate for alleged negligent operation of a plane by a club pilot. The club also carries insurance against public accidents on the airport or by an automobile driven by an airport employee.

Club members can purchase $10,000 of insurance on a per flight payment or monthly payment basis at the rate of one cent per minute of flying time. This life insurance coverage pays for permanent disability or loss of limb. Employees are covered with employer's liability insurance. Flying instructors pay on an annual basis for similar coverage as carried by members while in flight.

The RCFCA clubs operate as any private clubs do, with membership applications being passed on by the elected board of officers. The clubs operate under provincial charters, have annual meetings and financial reports. They are financed by membership dues varying, according to the club, from $10 a year up. Equipment and clubhouse facilities differ, depending on the club membership. As few clubs are yet in operation, those that are have applied their resources at present to getting flying started again. They are leaving development of clubhouse facilities until later when all the clubs are in operation and private flying is again flourishing.

Crossing Canada from east to west there are lightplane clubs at Halifax, N. S.; Moncton, and St. John, N. B.; Quebec, Montreal, Que.; Ottawa, Kingston, Toronto, Oshawa, Windsor, Goderich, Barrie, Welland, Hamilton, St. Catherines, Brantford, London, Kitchener, Port Arthur, all in Ontario; Winnipeg and Brandon, Man.; Saskatoon, Prince Albert, Regina and Moose Jaw, Sask.; Calgary and Edmonton, Alta.; Chilliwack and Vancouver, B. C.

However private flying expands in Canada, the flying clubs will be the center of Canadian lightplane activities. END

Mass-Producing the Merlin

(*Continued from page 53*)

were required, and contracts were let throughout the country. The need for this special equipment can be seen from just one example: the crankcase upper on the *Merlin* requires 77 machines performing 108 operations for completion.

There are a total of 14,000 pieces in the *Merlin*, while a whole Packard automobile contains only 7,140 pieces. Machining only the major parts of the Rolls-Royce engine required upward of 80,000 operations; on many parts the limit must be held to .0002". Packard found that machining a complete *Merlin* connecting rod required 31 standard hours of work, as against a half-hour for a similar car engine rod.

There were, naturally, other differences. Machining the *Merlin* cylinder block required 110 hours, where a car block requires only five; the *Merlin's* crankshaft must be machined for 49 hours, while the automobile crankshaft requires 4.5 hours.

Packard decided to apply typical automotive assembly line techniques to the job. The first continuous assembly line for aircraft engines was set up, consisting of a long main production line fed transversely by continuous subassembly lines, with the main line power-operated and ending at a test stand.

The continuous assembly line was also introduced to expedite the teardown and rebuild of engines after the "green run" on the test stand. After test operation, the engine is washed and started along a U-shaped disassembly and rebuild line. The ignition harness is removed, cleaned, inspected, and passed along the open end of the "U" to meet the same engine from which it was removed, becoming the last part to be re-assembled on the engine. In the same manner, the other parts and subassemblies are removed, and each passes through the hands of the dissemblers, inspectors and assemblers while journeying along the transverse lines between the two prongs of the "U." The crankcase passes around the closed end of the "U," is cleaned and inspected, then starts up the assembly side, acquiring its parts back in the proper order.

Packard found that this method of teardown and re-assembly could be followed in a minimum amount of space and that new employes could be taught the requirements of one detailed job on the

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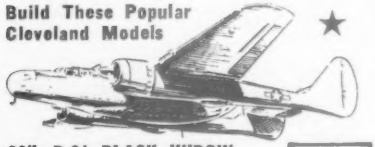

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"U" line in a comparatively little time.

Development ran a race with production, and through a series of engineering alterations which often numbered as high as 400 per month, the engine was refined into a power plant more powerful and versatile than any other in the Allied armory. For the British, Packard used the *Merlin Model XX* as the basic engine, and from it progressively developed 13 models. For the AAF, Packard used the *Merlin Model 60* as the basic unit, and developed 10 models.

Improvements developed jointly by Packard and British engineers raised the *Merlin's* ceiling to over 40,000 feet and its horsepower to more than 2,000, an increase of 50 per cent since the first Packard-built *Merlin* was produced.

Through hundreds of engineering changes production was simplified, costs lowered, time saved and the efficiency of the product improved. One such change, an improved camshaft drive originated by Packard, reduces by 21 the number of parts required and aids materially in servicing engines in the field. These production and engineering changes did much to increase manufacturing efficiency as completed engines began to roll off the final assembly line at a rate of $1,000. worth a minute.

This is the second time that Packard's two top men turned to aircraft engine production during a war. In 1918, Packard president (now board chairman) Alvan Macauley and Col. J. G. Vincent, vice president in charge of engineering, were instrumental in the design and subsequent development of the old *Liberty XII* engine.

Macauley and Vincent were joined by George T. Christopher (successor to Macauley as Packard president) in the World War II job of taking the British "fitter's" engine and mass-producing it faster and cheaper than the British dreamed possible. END

Why Fly Patterns?

(*Continued from page 61*)

much and how fast the student is improving.

2. It establishes a routine that a student can practice and thereby test himself. This is better than just going out and flying anywhere, anyhow, just to put in time.

3. It furnishes a problem from which there is transfer of knowledge to other problems, such as drift, completing turns early instead of late, holding altitude, etc.

4. It standardizes procedure, flight checks, practice hours, and makes for a high level of performance. If it is considered poor practice to enter a pylon upwind, inasmuch as this causes all turns to be made downwind, this standard should be upheld. The student who can't think such a problem through gives indication that he could also make an error sometime in a traffic pattern. A future, similar lack of headwork might mean a collision some day.

What then, is a pattern? There are two kinds:

1. Pattern on the ground. This is the most important kind because it is the path, or track, of the airplane over the ground.

2. Pattern in the sky, or the path traced by the nose. This is less important; it involves such maneuvers as the lazy eight, in which the nose traces the pattern on the horizon, or maneuvers like the chandelle in which the pattern in the air is combined with the pattern on the ground.

Figure 1 (page 61) illustrates the first principle of pattern flying. The plane is flying from A to B, and the pattern is the track over the ground. The plane is pointed into the wind, which indicates that heading and pattern are *not* the same—a point seldom clearly understood.

Figure 2 (page 61) illustrates the second principle of pattern flying, the S turn across a road. Anyone who thinks it is easy probably has not done it well or accurately. The principle is simply this: know exactly the track traced by your airplane along the ground. To do this, one looks down and sees what he flies over. He is not concerned with where the plane is pointed or how the wing is banked, except insofar as the heading helps him fly over the particular part of terrain he must fly over to make an even, symmetrical S.

How many maneuvers are there in which pattern is a factor that makes for the success of the maneuver? The answer is, *any* maneuver in which drift is a factor and in which the track of the plane over the ground is important. Some of these are, in approximate order of increasing technical difficulty:

1. Rectangular course around a field.
2. Landings.
3. Spirals.
4. "S" turns across a road.
5. Pylon eights around a pylon.
6. Spot landings.
7. Emergency landings.
8. Lazy eights.

If the student, or veteran pilot too, will remember that it is *where* he is flying, not how he flies, that makes the pattern, he will have overcome the error of flight that flight examiners call, "Letting the plane fly *you*." The problem of how you fly is a different problem, a matter of technique, something that should have been mastered, especially by the time a student is flying difficult maneuvers.

Let us consider some of the maneuvers listed above. The rectangular course is the easiest because any leg of a rectangular course is merely a straight line. All the pilot has to do is assume a heading that will result in the desired track. The general principle to be observed is covered in three points: (1) look ahead at the point over which one wishes to fly, and (2) look *below* (later) to see that the plane is accurately over the point, and (3) make necessary corrections in order to fly exactly over the next check point.

It seems to be the latter that is so diffi-

cult for students. It is easy to turn into the wind and make good a desired pattern, but students think once they have set or established a heading on a certain leg that it is a cardinal sin to make a correction. Actually it is a cardinal sin *not* to correct the heading as soon as the drift becomes apparent.

The second maneuver, a landing, is done from the base leg of a rectangular course. This maneuver is a series of corrections and recalculations. After the throttle is closed, the student must be able to think like this: "If I turn in now I'll overshoot. I'll take off some bank and fly farther to the right." In short, he is making good a pattern into the field and a precision landing, at least as to depth, although his accuracy with respect to the left or right side of the field may not be too good. This is the first step in learning a pattern for an actual spot landing.

Items 3 and 4, the spiral and the S-turn across a road, are very similar. The technique involves only the knowledge that the greater the ground speed the steeper must be the bank. Flying the proper pattern involves the ability to think, plan and fly the airplane *exactly* over a spot or according to plan.

To make a good S-turn, see Figure 2, note that it is not a series of U-turns and that the upwind and downwind curves are equal. The plane must be banked steeply going downwind, levelled out for a second or two crossing the road, and then put in a shallow bank when flying upwind. The pattern is the track, or the imaginary line on the ground over which the plane has flown.

The plane is flown over that pattern by this means: the pilot, after selecting his road, visualizes an S on the ground. His thinking should be like this: "I must fly from the road to the fence, from there to the tall tree, and keep turning back to the road." As he gets into the turn he knows that he must bank steeper going downwind, but what he actually thinks is: "I am drifting downwind from my pattern, so I must bank steeper and turn back toward the tall tree." . . . or, "The wind isn't as strong as I thought, as I am turning inside the tall tree. I must take off some bank and turn less sharply."

This progressive, aggressive thinking is the real key to the problem of pattern. To be sure, it assumes that the pilot has been taught how to fly, that he can fly by feel and that he knows how to make a turn without skidding, climbing or spinning in. This article is not so concerned with flight technique as it is with planning, pattern and *headwork*. To make such decisions as described in the above paragraph requires excellent calculation.

The next maneuver, the figure eight around a pylon, is slightly more difficult because the planning is more involved. The flight technique is difficult, too, as skidding, climbing or diving are grounds for rejection. Although most students can be taught to fly a pylon safely and smoothly, many still fail to make a good pattern.

To fly equidistant around the pylon is not easy, and to acquire this skill may seem useless. No one has ever taken a friend for a ride and said, pridefully: "Now I'll do a pylon eight for you." Who cares about a pylon eight? It doesn't prove anything *except* the all-important fact that anyone who can fly a good pylon eight can fly any kind of track he wants, can correct for drift in any situation, and is master of planning, sub-conscious control of the plane, and good headwork in other similar situations.

The thought process in flying an eight around a pylon could be something like this: "I am this far from the pylon. If I continue to turn this fast I will be over that small bush, which is too close. I must take off some bank. Now I must head for the second pylon so I level off. Am I drifting too much? If so, I must head more into the wind. Now I must start my second turn, and as this is a downwind turn I must bank more steeply than before. My pattern takes me directly over that fence intersection, so I will vary my bank in order to fly over it." And so on . . .

What this hypothetical student did was to correct consciously for error. Some pilots think that, once having made a decision as to the heading to fly toward the second pylon, they must remain doggedly on that heading even if it carries them a mile away. Make any required corrections until you get to the desired spot.

Items 5 and 6 are spot landings and emergency landings. In either case it is the *base leg* that is so important. Granted that the flight technique of constant airspeed has been attained, the other important factor is *pattern*. One must know where he is, where he wants to fly and how to head the plane to get it there.

For example, on the base or crosswind leg, the pilot must head the plane enough into the wind so that the base leg track is at right angles to the downwind and upwind legs. This provides an estimate of the wind velocity and where to turn for the final approach. In an actual emergency while we would approach high, slow and close to the field, we would also be flying a pattern or base leg that was within overshooting-distance of the field. Then by using flaps or slipping we would make it. Our thought process under such conditions would *not* be like this, "I certainly must remember to make a good pattern this time." But we would be trying to make one just the same.

Therein lies the whole crux of the problem. Much as we dislike patterns, both as students and as older pilots, we fly them as students because we are forced to and as veterans because we don't have to be consciously thinking about them. In the lazy eight maneuver, we merely trace with the nose an eight lying on its side on the horizon, half of it in the sky and half of it on the ground. When we forget the controls, the airplane and the pattern we fly it with grace and skill, and with consummate ease. But we still are making good a pattern.

Pattern pilots know how to fly a plane and can prove it to the satisfaction of any examiner. They don't get "sucked out of position" by a strong wind and they are master of themselves and the airplane. That is what counts. END

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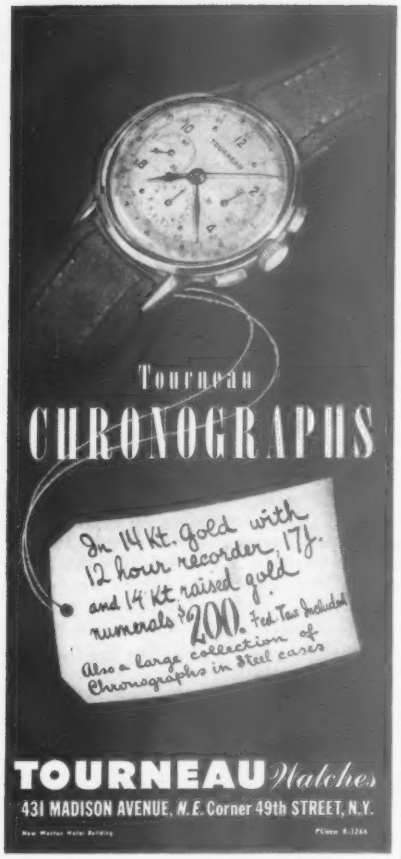
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Wartime Crash Strips

(Continued from page 57)

reserved for aircraft so badly damaged they couldn't make a circuit before landing and had to come straight in or crash land. The other two, or "white" runways, were for planes awaiting radioed landing instructions as they circled. This system allowed aircraft in more serious shape to land first.

The flight control officer was a master of crash landing strategy. He knew the characteristics of the individual aircraft he might have to land. He had to make up his own methods as he went along. At the end of each month he reported how he handled every emergency. These reports were forwarded to higher headquarters, published and distributed to other flight control men so that experiences and individual improvisations might be shared. These men were responsible for helping to safety almost 5,000 aircraft in less than a year.

Rescue and crash equipment on the three big fields was superior to any elsewhere, but there was a minimum of hangars and housing—excepting hospital facilities—to discourage other than distress traffic. Control towers had radio facilities for homing by Morse or voice and blind landings. All fields had mobile maintenance parties from the 8th Air Force and the RAF to facilitate aircraft repair. American forces had a liaison officer to care for U. S. crews, giving them what they needed, arranging transportation and issuing two ounces of bourbon for those with shaky nerves.

Consider the *Halifax* bomber that had been hit in the landing gear by a direct burst of *flak*. The pilot knew that two of his crewmen couldn't bail out. He came into an emergency field and crash landed safely on the bomber's belly.

Or the *Liberator* that had sustained the shock of three direct hits which had knocked out one engine, riddled the ship with 700 holes, cut all but the right rudder's control cables and left the bomber without brakes or flaps. There was so little control to the plane as it circled the emergency runway that at one time the pilot lost sight of the field—his circle was that wide. Finally he came in at 175 m.p.h. without brakes or flaps.

One evening in less than 30 minutes I observed six emergency landings at one of these super runways. The first plane in was a *Lancaster* which came in on the far right lane of lights. As it touched down, the left undercarriage buckled, the ship catapulted up on its nose and did a cartwheel and a half, landing on the far side of the field on its back. Rescue vehicles rushed to the scene and, as we watched, a huge crane picked up the bomber with a sling around the middle of the fuselage. With a sudden crunch the bomber broke in the middle, two engines fell off and a full bomb load spilled out on the runway. Miraculously, no one was hurt.

Hardly had the runway been cleared when a *Fortress* called in for emergency landing instructions. The pilot reported that *flak* had damaged his undercarriage and he would have to make a belly landing. The controller instructed him to come in over the green runway and lose altitude. When he reached the end of the runway he was to drop the plane in on the grass overshoot area. This was done and a successful landing was made with little damage to the plane and none to its crew.

Next came a *Fortress* on the far right lane. A tire blew, causing the undercarriage to buckle and snap off. The plane swerved to the left, flipped over on its side buckling a wing, and stopped half in the green and half in the white lanes.

Another *Lancaster* pilot called that he was on the approach and must crash land immediately, endurance low, plane badly damaged by *flak*. The controller instructed him to come in on the far right lane since the crashed *Fortress* was blocking the other two lanes. The instruction was followed and the *Lancaster* belly-landed on the concrete runway. Not having been informed that the pilot wanted to belly-land the controller had not instructed him to do so in the overshoot area. This left all three lanes blocked and the inevitable happened.

A *Halifax* pilot called in and reported that a hole in his starboard outer engine had so seriously damaged the wing that vibration was threatening to tear it off momentarily. With fast thinking, the controller ordered searchlights turned on the planes obstructing the runway and instructed the pilot of the *Halifax* to make his approach so as just to clear the top of the *Fortress* and land in the balance of the runway which would give him 5,000 feet of concrete and 3,000 feet of grass overshoot. Result: a successful landing.

The next plane to call in was a *Halifax* bomber with this radio message: "This is the bomb-aimer speaking. The pilot is seriously wounded and I'm flying the kite back. If you can assist me with instructions I believe I can land her."

The controller wiped the perspiration from his forehead and reached for the mike. He proceeded to tell, slowly and accurately in check list order, the proper movements to lower flaps and wheels and when to reduce power for landing. Meanwhile, the *Fortress* obstructing the two lanes had been removed. The controller told the bomb-aimer to come in on the green lane. We could see his running lights and it was obvious that he was too high and was going to overshoot. The controller instructed him to apply power, pull up and go around again.

The plane climbed higher and roared past us. On the next approach the plane came lower and lower with no further instruction, other than a quiet word to instill confidence. We held our breath until we heard the unmistakable squeal of rubber as it bit concrete. Down and safe. Over the radio we heard the bomb-aimer's voice, for the first time lacking the assurance we had noted in his first call, as he breathed softly, "Thank God."

Not all the stories end so fortunately. I

remember particularly the parachute era. This was a period when some lucky fellow had used parachutes for brakes after landing and had succeeded. Unfortunately it got into the newspapers and new pilots took it as a "sure fire" safe method of secondary brakes. Our experience has been otherwise.

One afternoon a *Fortress* came onto final approach firing distress flares and from radio contact we found it had a wounded man aboard and that the plane landing would be without brakes. As the plane made the final approach, a parachute blossomed out of the left waist window. With a sudden jerk the huge plane flipped over on its back, crashed to earth and blew up. No one will ever know the exact story. It was assumed the pilot had planned to use chutes as brakes when he landed but that one of the waist gunners was nervous and had opened a chute prematurely.

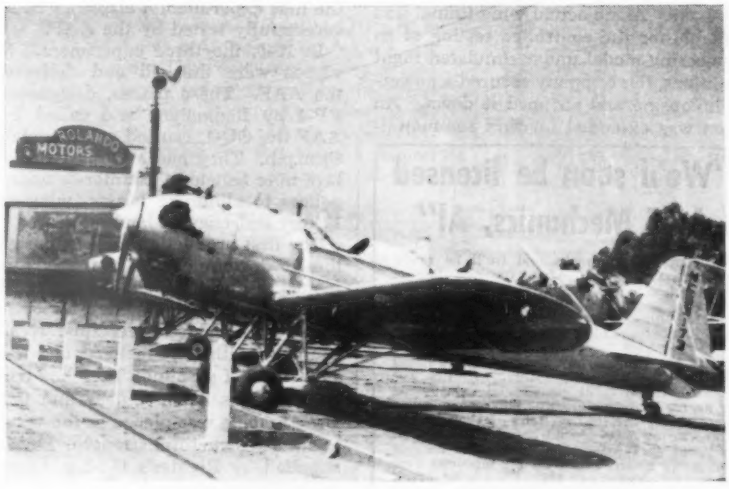
There were other cases. A *Liberator* pilot called in from 13,000 feet saying he had a violent tail flutter. The controller asked several questions, realized there was structural failure. He advised the pilot to bail his crew immediately, set the plane on autopilot, head it out to sea and bail out himself. The pilot argued that he could land the craft and he had asked the crew to stick. The controller replied that that was his prerogative but urged him to bail out and not to attempt to land. Before a reply came back the plane was enveloped in flame and plummeted to earth. No one was saved.

Everyone remembers the story of the radio operator who arrived back in England without the rest of his bomber's crew. The plane had been hit over the target and had caught fire. The pilot ordered the crew to bail out, but the radioman, being afraid to jump, hid in the bomb bay. As soon as he saw the pilot go out, he crawled into the co-pilot's seat. He held the plane on course. Shortly after he took over the fire went out. Several Allied fighters seeing the lone bomber came up alongside as protection and the little radioman called, "Everyone's bailed out except me, what'll I do?"

The fighter came back with, "Stick to it and set up the automatic pilot." Replying that he did not know how, the radio operator sat back and got instructions from the fighter pilot. Three hours later the planes crossed the English coast and the fighter pilot told the bomber the emergency runway was below.

The radioman called the field and explained his predicament, receiving advice to bail out. His reply was—"no." They advised him to land the plane. He also refused this and to the amazement of everyone swung out over the Channel and proceeded to ditch the bomber. Unfortunately, his attempt was not successful.

Despite the losses, the emergency runways were one of those good things of the war. Whenever a group of ETO flying men get together, the names Manston, Woodbridge and Carnaby almost always bring at least one happy smile—and someone recalling: "Yes, thank God, I remember them." END



USED PLANE LOT

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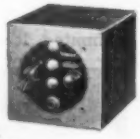

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Aerial Robots

(*Continued from page* 32)

Whittier and Case doing the actual work.

Crackups, by this time, were proving both monotonous and expensive. Flight tests of the RP-3, conducted at March Field, Calif., met with only partial success. Actual construction of the AAF models had not yet started as neither the RP-2 nor the RP-3 fulfilled expectations although successive models showed marked progress. Then the Whittier estate withdrew financial aid.

Denny and Whittier, now without capitol, began calling on bankers.

One day the telephone rang in the office of Whitley C. Collins of the Collins-Powell Company. Collins had many fingers in the aviation pie. He had been general manager, treasurer and a director in the original Lockheed Aircraft Company. He also was vice-president of the Elastic Stop Nut Corporation of America and director in the Menasco Manufacturing Company.

Collins and his partner, Harold H. Powell, had been successful with many gadgety and gimmicky projects.

The caller told Collins, "I've got a man named Denny in my office. He has an Army contract for a radio-controlled, pilotless target plane and no cash. You'd better talk to him."

Collins and Powell conferred with Denny and were enthusiastic.

"The Army specifications exceeded by far the accomplishments of the first three planes," Collins said. "There is a tremendous job to be done. We have to develop a target plane which will have positive response to radio control under all conditions, catapult launching mechanisms and a parachute release."

Collins and Powell took a chance and estimated it would cost them between $50,000 and $75,000 to fulfill the $11,000 experimental contract.

The first step was to divorce the radio plane experiments from Reginald Denny Industries, Inc. Radioplane Company was formed, with obligations to the Whittier estate being met. Stock in the new company was divided nearly equally among Denny, Whittier, Collins and Powell. Later, Whittier bowed out, selling his interest to Powell and Collins.

Today, Collins is president; Powell is executive vice-president; Denny is secretary and William Larrabee, Los Angeles corporation lawyer, is general manager and treasurer.

Also in the administrative set-up is Ferris M. Smith, vice president in charge of engineering, who was drafted from a promising career with the "big fellows" by Collins to help design, engineer and build the potent little ones. He was influential in the design and development of the Douglas' DC-1, DC-2 and DC-3 and was project engineer on Lockheed's substratosphere job, the XC-35, and the XP-49. Collins got him from Lockheed in June, 1942.

"All we did," Smith says today, "was to take a gimmick with possibilities and, working together, prove it out."

With the formation of Radioplane Company, expansion started. The first plant had an area of 797 square feet, not quite that of a bungalow.

One of the first developments was a 120-m.p.h. open air wind tunnel at Muroc Dry Lake. As no actual wind tunnel was available for the controlled testing of an engineering model under simulated flight conditions, the company secured a powerful limousine and stripped it down. An apron was extended forward for mounting the test plane to obtain longitudinal balance. Design changes to eliminate the balance "bug" were quickly made without trial and error crash losses. This "wind tunnel" made possible the meeting of certain AAF specifications.

Three types of launching devices were chosen. For land, a catapult about 36 feet in length, powered by shock cord, was perfected. Mobile, it can always be turned into the wind. For battleships and other large vessels an adapter was designed to fit the standard seaplane launching catapult and a low power cartridge was used to motivate it. For launching from AVR boats, which are fast, a very light catapult about three feet long was perfected.

The old dial control system was replaced with the stick described earlier. A solenoid was rigged so that when the carrier wave was cut it released a catch on top of the fuselage which allowed a section to whip up and pop the parachute into the airstream. This section also pulled a wire which stopped the engine.

The servo unit operating the controls also was greatly improved. This unit, controlled by audio frequency through the receiver-selector, consists of two motors operated by a battery and a series of gears which actuate rudder and elevator. Shifting of this battery accomplishes longitudinal stability. After Radioplane's original development, the servo was turned over to the Special Weapons Unit at Wright Field, Dayton, O., for refinement. It was then produced by a clock manufacturing company.

The radio control box, receiver-selector and transmitter were greatly improved by the Aircraft Radio Laboratory and Special Weapons Unit at Wright Field after the first experimental airplanes had been successfully tested by the AAF.

In 1940, the three experimental target planes were finished and delivered to the AAF. These planes, designated the RP-4 by Radioplane and called by the AAF the OQ-1, cruised at approximately 80 m.p.h. They had a welded steel fuselage nine feet long, counter-rotating propellers to eliminate torque, wingspan of 12 feet and tricycle landing gear.

The first production models, designated the RP-5, came off the high-speed manufacturing line in June, 1941. The Army took them as OQ-2. They hit 85 m.p.h. These had welded steel tube fuselages, counter-rotating propellers and carried 1.2 gallons of gasoline. They had triangular fuselages, landing gear and tailskid. Drag bracing was placed in the wings for additional structural strength. Power was supplied by Righter's 6½-h.p. two-cycle, two-cylinder opposed engine, which had been used in the successful experimental models.

Righter's engine enterprise became Radioplane's one and only subsidiary and engines poured out of this Burbank plant as fast as fuselages came off the production lines at Radioplane's new headquarters at Metropolitan Airport, Van Nuys. Righter remained with the company until May, 1945, when the company purchased his interest in his engine concern. During both pioneering and production years he had produced many experimental and

Photo by Newsday

"We'll soon be licensed A&E Mechanics, Al"

"A couple more weeks and we'll be ready to take the C.A.A. exam for our Engine Mechanics' license," said Bob.

"You know, Bob, I'll always be glad I entered Roosevelt Aviation School when I graduated from high school."

"Why?"

"If I'm drafted, my training will put me in line for a better rating. If I'm not needed, I can enter commercial aviation as a licensed mechanic. But how come **you're** here taking the course, Bob? I thought you were in an AAF ground crew?"

"And so I was, Al. Many's the bomber we Army mechs tuned up for missions over Germany. The Army taught me a lot about planes—but I didn't get any license out of the deal. And remember, it's the licensed mechanics who are preferred."

"Yes, every aircraft repair station must have a licensed mechanic," answered Al. "All others, no matter how experienced, must work under the man with the license. It's the license that counts."

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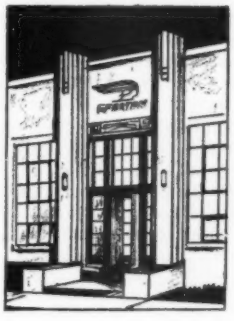

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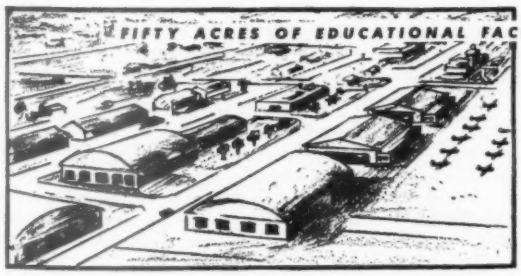

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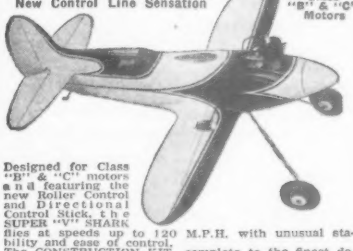

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production engines of various horsepower, starting with the old *Dennymite* 1/5-h.p. and ending with production engines of 22-h.p., developed at 3,800 r.p.m.'s.

In the meantime, the RP-5A started running off the lines in May, 1942. The Army designated this the OQ-2A. The Navy had become interested, awarded the company a contract, calling it the TDD-1. It was a refined version of the OQ-2, carrying 1.8 gallons of gasoline and cruising at 88 m.p.h. Counter-rotating propellers were still used.

By this time, the greatest need was to increase the speed of the planes.

One commanding officer of an Army target plane detachment told the writer:

"At first, the slower babies were hard to hit. But pretty soon we were shooting target planes out of the sky like flies. We needed more speed. Slow targets wouldn't help gunners hit fast planes."

In December, 1943, when production of the OQ-3 (Navy TDD-2) was under way, further research was undertaken. The OQ-3 cruised at 103 m.p.h. with an eight-h.p., two-cycle, two cylinder opposed engine, heavier steel tube construction with keel, single propeller, no landing gear and refinements in equipment installation. The counter-rotating propellers were abandoned when it was found that the effect of the torque was minor except at low speeds and that "pilots" had become skilled enough to overcome its effect during take-off.

A radically new target plane emerged in April, 1944. Experimentally, it was known as the RP-8. It was powered by a 20-h.p. Righter twin, and it clicked off 141 m.p.h. Among improvements were heavier tail surfaces, smaller rudder and elevator, wings set flush against the fuselage, and a 2.25-gal. fuel tank. This emerged as the production model RP-8A (Army OQ-14, Navy TDD-3). Little was done in refining save to design for the fastest and most economic production.

And Radioplane was big industry. It had jumped floor space from 979 square feet to 69,500 square feet, including five buildings. Speed had jumped from 50 to 140 m.p.h.

In 1940 the company had produced three target planes. Now, with a combined total of 250 employees, it was shipping between 50 and 100 units a day.

Experimental planes followed each other in rapid succession. In November, 1944, two RP-15's (Army OQ-6) clocked 195 m.p.h., with two-cycle, four-cylinder horizontally opposed engines, designed by McCulloch Aviation Company, of Milwaukee. McCulloch had turned out the best of several power plants in competition with other designers.

Using this same 65-h.p. engine, the RP-19, which has metal fuselage and wings, has been flown at 225 m.p.h. The McCulloch engine turns 4,100 r.p.m

In addition, experiments are getting under way with jet propulsion. It is believed by company engineers that 400 m.p.h. is well within range.

"Pilots" report that the little target planes are very easy to fly. One Army detachment commander said that when sufficient clear space was available it was possible to make take-offs and landings without using either catapult or chute.

Because of vigorous experimental programs, as well as gunnery training operations being carried on by both services despite war's end, Radioplane company has made only slight readjustments of its manufacturing program. In fact, as the target planes become better and better, it is believed in many circles that the day of the piloted warplane is coming to an end.

An indication of this is shown in Collins' statement:

"Today we have shown more than 225 m.p.h. Radio control range of the RP-1 was limited to 400 feet. Today's production models are limited in control only by range of vision. They have been piloted from the ground at altitudes up to 16,000 feet and are operable, using from eight-power to 20-power binoculars and telescopes, far beyond the range of unaided vision." END

London Letter

(*Continued from page 56*)

sociation were being drawn) paid a tribute to the courage of Allied saboteurs who, he said, were often middle-aged or old men. They were dropped by parachute wearing "strip-tease suits" containing many articles of equipment from compasses to spades. The suits are so called because, although they take a quarter-of-an-hour to put on, they can be discarded in five seconds to permit immediate freedom of action on the ground.

Ejector seats and automatic parachutes are now being introduced in fast, jet-driven aircraft of Britain's Royal Air Force. In an emergency the pilot can "fire" himself out of the cockpit by special cartridges.

Air League Chairman

A change has taken place in the chairmanship of the executive committee of the Air League of the British Empire. New chairman is Air Chief Marshal Sir Philip Joubert de la Ferté, who tries desperately to make people forget the last three parts of his name and to call him Joubert. The Air League seeks to influence public opinion by writings and broadcastings in favor of aviation. The League is against the nationalization of British civil air transport.

Sea Vampire's Claim

The claim is made that the de Havilland *Vampire* flown on and off H.M.S. Ocean by Lieut. Comdr. Eric Melrose Brown, naval test pilot, on December 4, was the first all-jet aircraft to work from a deck. Both take-offs and landings were uneventful.

Two Of A Name

Temple Press, publishers of *The Aeroplane*, have brought out the first number of a new magazine called *Air Transport*. During the war, Staples Press had brought out a book with the same name

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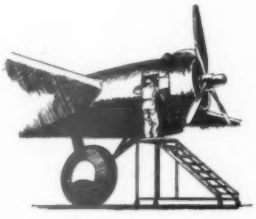
"Civil Aviation in the U. S. can provide more than 750,000 new jobs in the next ten years, according to a recent report of the Civil Aeronautics Administration. The government agency also forecast that more than 400,000 private planes will be in use in the U. S. by 1955."
Reported by Associated Press



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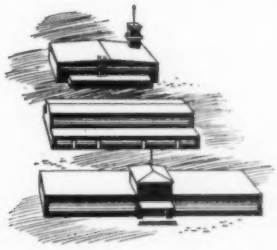

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and now announce further editions of it.

The Temple Press publication is edited by John Longhurst with Stanhope Sprigg acting as managing editor. First number contains 14 pages editorial and eight pages of advertisement. It uses color.

The Staples Press publication is edited by Ronald Walker, popular air correspondent of London daily *News Chronicle*. Walker just completed a U.S. tour.

Test Pilot Killed

Everybody in British aviation felt sympathy for the pioneer constructor and brilliant speaker, Sir Frederick Handley Page, when the *Hermes* was lost with chief Handley Page test pilot, Flight Lieut. J. Talbot, and the Engineer, E. A. Wright. The *Hermes* is one of Britain's most promising civil transport designs. The company's decision to go straight on with the next one and also with the *Hastings*, a freighter version, was generally applauded. END

Letters

(*Continued from page* 66)

flight? It is a violation of CAR to make an instrument flight without filing a flight plan.

CAPT. GEORGE CONROY, AC

Hamilton Field, Calif.

● Author Bennett stated that the same condition prevailed behind him.—ED.

LIGHTPLANE FOLDING WINGS

To reduce hangar rent, why can't lightplanes be built with folding wings? A manual control could be developed to unlock wings by hand, fold low wing planes upward (similar to the *Helldiver*) and secure them at the wing tips.

Safety features could be incorporated in series with the ignition, brakes or control lock to prevent take-offs with the wings unlocked. Planes with a high wing could be folded back and secured to the vertical stabilizer.

Thus private plane owners could take advantage of roadside strips that are in the planning stage or, if hangar space were rented, a substantially reduced rate could apply because of the larger quantities of planes that could be stored.

LIEUT. JAMES R. SPRAGUE, USN

Atlantic City, N. J.

● The *Airsedan*, brainchild of FLYING's editors, shown in the August, 1945, issue highlighted the folding wing idea.—ED.

INSTRUMENT BEEF

Col. T. B. Holliday must be a "ground-gripper," for no pilot would propose a statement such as the one made in his article in the December issue of FLYING.

I've yet to see the airplane in which you could hold a constant rate of climb for a reasonable length of time in order to use it as a basis for aligning the other instruments. Especially is this true of a lightplane.

AAF PILOT

Sebring, Fla.

CORRECTION

In "Aircraft of the U. S. Armed Forces," September, 1945, FLYING, you omitted the Bristol *Beaufighters*. They were used by the 415th Night Fighter Squadron in the African campaign and as late as May 2, 1945.

LIEUT. NELSON G. THOMAS

New York

CROSS-WIND LANDINGS

In a recent issue of FLYING, your Washington correspondent made some criticisms of the Maclaren drift undercarriage and cross-wind landings to which we reply herein.

Cross-wind landings with Maclaren drift gear have not only been made with *Mustangs* at right angles to winds exceeding 60 m.p.h., but also with light, personal-type planes. There is no difficulty in determining the angle of drift for experience showed that after a small amount of practice, pilots are able to estimate this angle with no more than a glance at the wind sock.

This is normal procedure and no special device has been fitted to the aircraft other than that which indicates the position of the wheels. Aircraft with the wheels in drift position are more stable than normally, and in no case has a ground-looping tendency been reported.

Setting the wheels in landing position is a small pilot operation, well worth the convenience of operating from a single strip. Maclaren drift gear permits fast taxiing, take-off against high winds and maneuvering on sloping ground.

I. J. REES

The Maclaren Undercarriage Co.

Hounslow, Middlesex, England

CARTOON CREDIT

My husband's article, "I Learned About Flying from That!", in the September issue of FLYING, neglected mentioning that his co-pilot, John Carmody, drew the cartoons which accompanied the story.

Will you please rectify this error, for I'm sure that my husband wants proper credit given where it is due.

MRS. JOAN CHURGIN

White Plains, N. Y.

● Omission of Mr. Carmody's name was an oversight. Sorry.—ED.

"BIT O' LACE"

In your October color section, I noted my old 709th Squadron of the 447th Bombardment Group, with my old friend, "Bit O' Lace," third from the right.

Her number, however, was 297976, not 297876. The letter D was for "Dog," our call-letter. The old kite is dear to my heart, for she brought us all home safe and sound from Kiel last April minus most of the left horizontal tail after a direct hit in the bustle.

On the left side of the nose was a beautiful replica of Milt Caniff's Miss Lace, of "Male Call" fame.

T/SGT. J. H. KIRKWOOD

Las Vegas, Nev. END

The Eye Test Fallacy

(*Continued from page* 34)

to a test for stereopsis. It is almost exclusively a muscle sense test.

This question now arises: "How can a one-eyed person pass the depth perception test?" The answer is that he does not pass it unless he learns a little trick that most of those, even with two eyes, soon discover and adopt. If you sit a bit to one side of the apparatus, the two black pegs seem to come closer together and farther apart as they pass one another. By moving your head a little, while making the test, you can easily catch the sensation and make a good estimate with only one eye. In fact, you just about have to "fudge" a little in the above manner

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Some stabilizing effort must be made to guard against a chaotic condition in civil aviation. Government agencies, however capable and far seeing, are not enough. It is through an organization of flyers themselves that geographical, individual, and group problems can be resolved into a concerted and unified plan for action.

Such an organization is AOPA. Active for years, it has thousands of members, and is the largest association of non-scheduled pilots and owners in the world. Membership gives the individual flyer a powerful voice—the united voice of many fellow member-pilots with the same interests and the same problems, and with one great objective—to make personal flying safer, more enjoyable and less expensive.

AOPA operates on a non-profit basis and is dedicated to the advancement of private flying. Ask your fellow pilots, and write in for details of AOPA's long range 24-point program. If you desire to join immediately use the coupon below; annual dues are only $5.00 and you are eligible for membership if you have soloed. You owe it to yourself to join AOPA—"*the automobile club of the air.*"

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to pass the test satisfactorily even if you have both eyes to help you.

From the above analysis, it is evident that depth perception as applied to distances useful to pilots actually is not a special function of the visual apparatus *per se*. On the contrary, estimation of distances of more than 15 to 20 feet is definitely a question of an intelligent interpretation of phenomena which *all* seeing eyes have the power to behold.

There has been considerable pressure brought to bear upon the Civil Aeronautics Administration to relax some of the physical requirements for a pilot's license. Naturally the CAA is being cautious since upon its shoulders rests the responsibility of making flying as safe as possible. However, CAA is to be congratulated upon having eliminated this worthless test from the private flyer's physical examination. Unless some test is devised with a far more ingenious mechanism than the present depth perception test—one which will prove a pilot's ability to interpret some of the other seven factors of depth perception—no depth perception test whatever should be required in pilot physical examinations. END

I Learned About Flying From That!

(*Continued from page 62*)

At this point I was about 175 feet off the ground. I made my decision, pulled the nose up almost to the stall point, threw the aileron full left, held a little top rudder and actually attempted to pivot about my wing tip. It worked for about a quarter of the turn, then the bottom dropped out. I slapped the switches into the "off" position, hunched my shoulders and yelled some silly thing in Italian to Mario who I could see was gripping the sides of his seat. We hit on our left wing tip and it crumpled almost evenly toward the fuselage.

As the plane lost momentum and settled, the left gear hit, broke off and then the right side of the plane slammed hard into the ground. If you have ever cracked up a plane you undoubtedly remember the tremendous silence that follows the crash. Mario and I both sat there just sort of listening to that silence.

My first thoughts were about Hailie Selassie and what he might think of the American pilot who had wrecked his "air force." Looking back now I think that I might have gotten away with the maneuver I attempted had I been flying into the wind.

It was the combination of factors that led to my accident—the downwind approach increased my ground speed and thus caused me to near the hill just that much faster, the thinner air at this altitude reduced the rate of climb and available horsepower just enough to bar my clearing the hills. I have since thought twice about every downwind turn I have made, making sure that I had ample airspeed and was not fooled by the speed with which I was passing over the ground. END

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